

TermiNet^{*} DATA COMMUNICATION PRODUCTS

MP MASTER



MA32592

**TermiNet 9610
COMMUNICATIONS CONTROLLER
SERVICE MANUAL
GEK-49301A**

GENERAL  ELECTRIC

*Trademark, General Electric Company, USA

The information contained herein does not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to General Electric Company, USA.

TermiNet

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TABLE OF CONTENTS

<u>CHAPTER</u>	<u>PAGE</u>
1 INTRODUCTION	1-1
General Information	1-1
Physical Description	1-1
Specifications and Characteristics	1-3
Standards	1-3
Data Specifications	1-3
Environmental Specifications	1-3
Electrical Specifications	1-3
Model Number	1-4
Serial Number	1-4
2 PREVENTIVE MAINTENANCE	2-1
3 TROUBLESHOOTING	3-1
Troubleshooting Guide	3-2
Microprocessor and Control Board (MPCT)	3-5
Microprocessor Input/Output Board (MPIO)	3-7
Microprocessor Extended Memory Board (MPEM)	3-9
4 PARTS REPLACEMENT	4-1
Printed Wiring Boards	4-1
Cooling Fan	4-1
Motherboard	4-1
5 REPLACEMENT PARTS	5-1
6 SERVICE DRAWINGS	6-1
Service Drawings	6-1
Mnemonic Glossary	6-2

LIST OF ILLUSTRATIONS

<u>FIGURE</u>	<u>TITLE</u>	<u>PAGE</u>
1-1	TermiNet 9610 Communications Controller	1-2
1-2	Externally Mounted TermiNet 9610 Communications Controller	1-3
3-1	TermiNet 9610 Communications Controller Interconnection Diagram (2 sheets)	3-3
3-2	Microprocessor and Control (MPCT) Printed Wiring Board	3-5
3-3	Clock Generator Wave Forms	3-6
3-4	Microprocessor Input/Output (MPIO) Printed Wiring Board	3-8
3-5	Microprocessor Extended Memory (MPEM) Printed Wiring Board	3-9
5-1	TermiNet 9610 Communications Controller Mounting Configurations (3 sheets)	5-2
5-2	TermiNet 9610 Communications Controller Subassembly (3 sheets)	5-5
5-3	AC Switch Box	5-9
5-4	MPCT Printed Wiring Board	5-10
5-5	MPIO Printed Wiring Board	5-11
5-6	MPEM Printed Wiring Board	5-12
5-7	MPSL Switches and LED's Cable Assembly	5-13

INDEX

Altitude Specifications	1-3	Maintenance	2-1, 3-1, 4-1
Cables, Interface	6-1	Memory Capacity	1-3
Characteristics	1-3	Mnemonic Glossary	6-2
Cleaning	2-1	Model Number	1-4
Clock Generator	3-6	Motherboard Replacement	4-1
Cooling Fan	4-1	MPCT Board	1-1, 3-5
		MPCT Board Replacement	4-1
Data Rate	1-3	MPEM Board	2-9
Data Specifications	1-3	MPEM Board Replacement	4-1
Description	1-1	MPIO Board	3-7
Dimensions	1-2	MPIO Board Replacement	4-1
Drawings, Elementary	Section 6	MPMB Board	1-1
Drawings, Engineering	Section 6	MPMB Board Replacement	4-1
Drawings, Service	6-1		
		Ordering Parts	5-1
Elementary Drawings	Section 6		
Engineering Drawings	Section 6	Parts List	5-1
Electrical Specifications	1-3	Physical Description	1-1
Environmental Specifications	1-3	Preventive Maintenance	2-1
Fan, Replacement of	4-1	Rate, Data	1-3
Functions, MPCT	3-6	Registers	1-3
Functions, MPIO	3-8	Replacement of Parts	4-1
Fuses	3-5		
		Serial Number	1-4
General Information	1-1	Service Drawings	6-1
Glossary, Mnemonic	6-2	Size	1-1, 1-3
Guide, Troubleshooting	3-2	Specifications	1-3
		Standards	1-3
Humidity Specification	1-3	Strapping Options	3-6, 3-7
Illustrated Parts List	5-1	Temperature Specifications	1-3
Interconnections	3-3, 3-4	Test Points	3-6, 3-7
Interface Cables	6-1	Troubleshooting	3-1
LED's	1-1, 3-2, 3-5, 3-7	Wave Forms, Clock Generator	3-6
		Weight	1-3

CHAPTER 1

INTRODUCTION

GENERAL INFORMATION

The TermiNet 9610 Communications Controller is an option which, when connected between a TermiNet Printer and a data line, will enhance the operation and use capability of the printer. The Controller allows the TermiNet Printer(s) to operate in system configurations where they previously could not because of data rate, code format or line discipline. It also provides printer enhancement through data buffering and error detection.

The Controller is a self-contained, factory programmed electronics module. It consists of three circuit boards, a Mother Board, and an integral power supply system. The circuit boards contain: a central processing unit, memory (RAM, ROM and PROM), I/O ports, and power supply regulation. The TermiNet 9610 Controller circuitry is designed around the 8080A 8-bit microprocessor and the associated family of integrated circuits. The operation of the Controller is automatic and is controlled by a program stored in factory programmed, non-volatile Read Only Memory (ROM) circuits. Some Controller configurations allow a control program to be loaded into volatile Random Access Memory (RAM) locations from an external data source such as a magnetic tape or punched card. The stored program commands are then acted upon by the central processing unit to direct the operation of the Controller.

I/O communications ports on the Controller provide serial asynchronous, serial synchronous, and parallel interfacing. Two RS-232 asynchronous ports provide baud rates of 300 baud, 1200 baud, or a programmable baud rate. Two RS-232 synchronous ports are available when provided with external transmit and receive clocks. These ports are alternately available as asynchronous ports. Two parallel ports provide interfacing for a card reader and a TermiNet Line Printer; however, the design flexibility of the ports is such that they may be useful in other interface applications as well.

A Controller-directed terminal is intended for use in multi-point and point-to-point transmissions networks, and will perform using many line disciplines. The Controller controls startup and shutdown of the associated printer, and communicates with the operator by means of the indicator lights on the Printer Con-

trol Panel in accordance with the line discipline being employed.

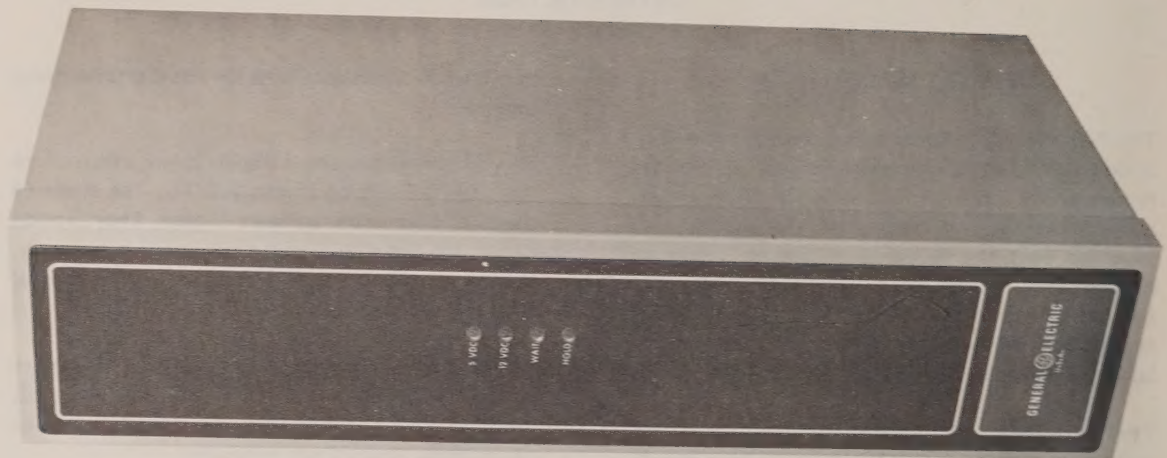
The Controller contains a display driver which drives eight Light Emitting Diodes (LED's). The states of the LED's are under software control. They provide Controller operational status information. Normally, the LED's are not visible to the operator. An external LED box is optionally available.

The Controller is designed to be an interrupt-driven system. Interrupts are accepted from all of the I/O ports. In addition, provisions are made for software controllable, timer-driven interrupts.

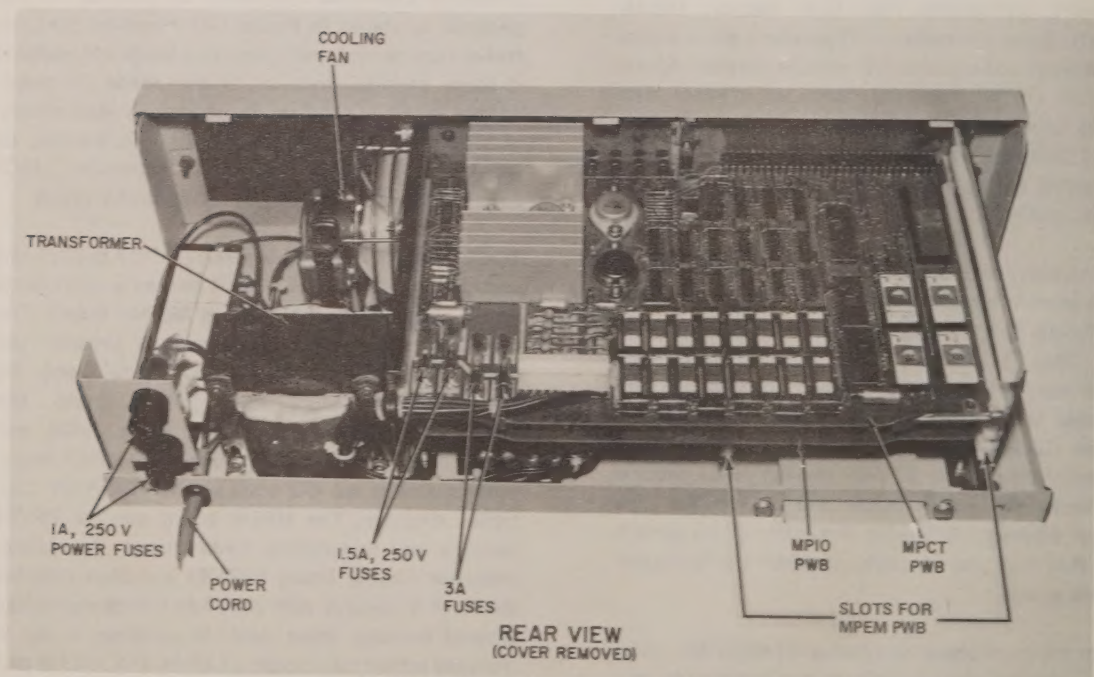
PHYSICAL DESCRIPTION

The TermiNet 9610 Communications Controller circuit boards and power supply system are housed in a metal enclosure with overall dimensions of approximately 8x16x4 in. (20.3x40.6x10.2 cm). The Controller is illustrated in Figure 1-1. The standard preferred Controller mounting is external to the pedestal (as shown in Figure 1-2). However, the Controller may be optionally mounted inside the pedestal if space permits. Provision is also made for multi-voltage input for utilization of various local supply voltages. AC cable and switch box conforming to International Electrotechnical Commission (IEC) specifications are provided with this configuration.

The Controller contains two 7x11 in. (17.8x27.9 cm) and one 5x7 in. (12.7x17.8 cm) printed wiring boards which plug onto a fully bused Mother Board. The Controller electronics is apportioned between the Microprocessor Controller (MPCT) board and the Microprocessor Input/Output (MPIO) board. The MPCT board contains the CPU, ROM, RAM, and power supply regulation circuits. The MPIO circuit board contains the I/O ports and the Interrupt Controller circuitry. The MPEM board provides PROM memory and non-volatile RAM storage. The Microprocessor Mother Board (MPMB) has three slots for the 7x11 in. boards with complete interchangeability allowed between these slots. In addition, a slot is provided which can accept a 5x7 in. (12.7x17.8 cm) printed wiring board (i.e., the MPEM board). The power supply which powers the Controller circuitry is mounted beside and beneath the board mounting frame.



FRONT VIEW
COVER INSTALLED



TCC-7001

Figure 1-1. TerminiNet 9610 Communications Controller.

f. International Electrotechnical
Commission 435

DATA SPECIFICATIONS

Data Word Size:	8 bits
Instruction Set:	78 Single, Double, and Triple Byte Instructions
Memory Capacity:	64K Addresses
General Purpose Registers:	Seven
Memory Cycle Time:	0.5 usec.
I/O Data Rate:	9600 Baud Max. Synchronous
Transmission Codes:	All 5, 6, 7, and 8 Level Codes
Operating Mode:	Half or Full Duplex
Interface Types:	Serial Asynchronous Input Output Interface Serial Synchronous Input Output Interface Parallel Closed Loop Out- put Interface Parallel Closed Loop Input Interface Card Reader Parallel Port

ENVIRONMENTAL SPECIFICATIONS

Temperature, Operation:	+32F to +110 F (0C to 43C)
Temperature, Storage:	-40F to +160F (-40C to 71C)
Altitude, Operation	12,000 feet (3660 meters)
Altitude, Storage:	50,000 feet (15,240 meters)
Humidity:	5-95% Relative, Non- Condensing
Size:	8 x 16 x 4 inches (20.3 x 40.6 x 10.2 cm)
Weight:	18 pounds (8.1 kg)

ELECTRICAL SPECIFICATIONS

Input Requirements:	110 117 200 220 240VAC $\pm 10\%$ 50 60 Hz at 2 amps
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TCC-7002

Figure 1-2. Externally Mounted TerminoNet
9610 Communications Controller

SPECIFICATIONS AND CHARACTERISTICS STANDARDS

The TerminoNet 9610 Communications Controller satisfies the requirements of the following standards.

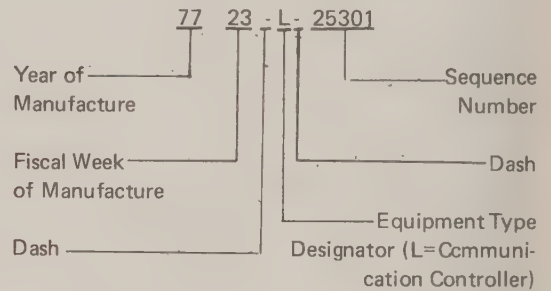
- Underwriter's Laboratory Standard 478
- Canadian Standards Association C22.2 No. 154
- Federal Communications Commission Rule 15
- EIA Standard RS-232C
- American National Standard Committee
USASX3.4-1968 and USASX3.28-1971

MODEL NUMBER

A nameplate attached to the TermiNet 9610 Controller contains the model number.

SERIAL NUMBER

The serial number will consist of a ten digit or alphanumeric series, and will be constructed as follows:



CHAPTER 2

PREVENTIVE MAINTENANCE

The TermiNet 9610 Communications Controller does not require any formal preventive maintenance program and no periodic adjustments are needed.

It is suggested that any accumulation of dust which may lodge inside the Controller chassis and on the

circuit boards be removed during the preventive maintenance routine for the associated printer. This is best accomplished by using a gentle stream of air or a soft bristle brush. Also, check the Controller cooling fan for proper operation, and check all cable and cable clamps to be sure they are secure.

CHAPTER 3

TROUBLESHOOTING

GENERAL INFORMATION

The TermiNet 9610 Communications Controller has been designed so that maintenance can be performed in the field with a minimum of system understanding. The Controller interconnection diagram is provided in Figure 3-1. The MPCT, MPIO and MPEM printed wiring boards connect onto the Mother Board which serves as a backplane wiring panel. A table of MPIO

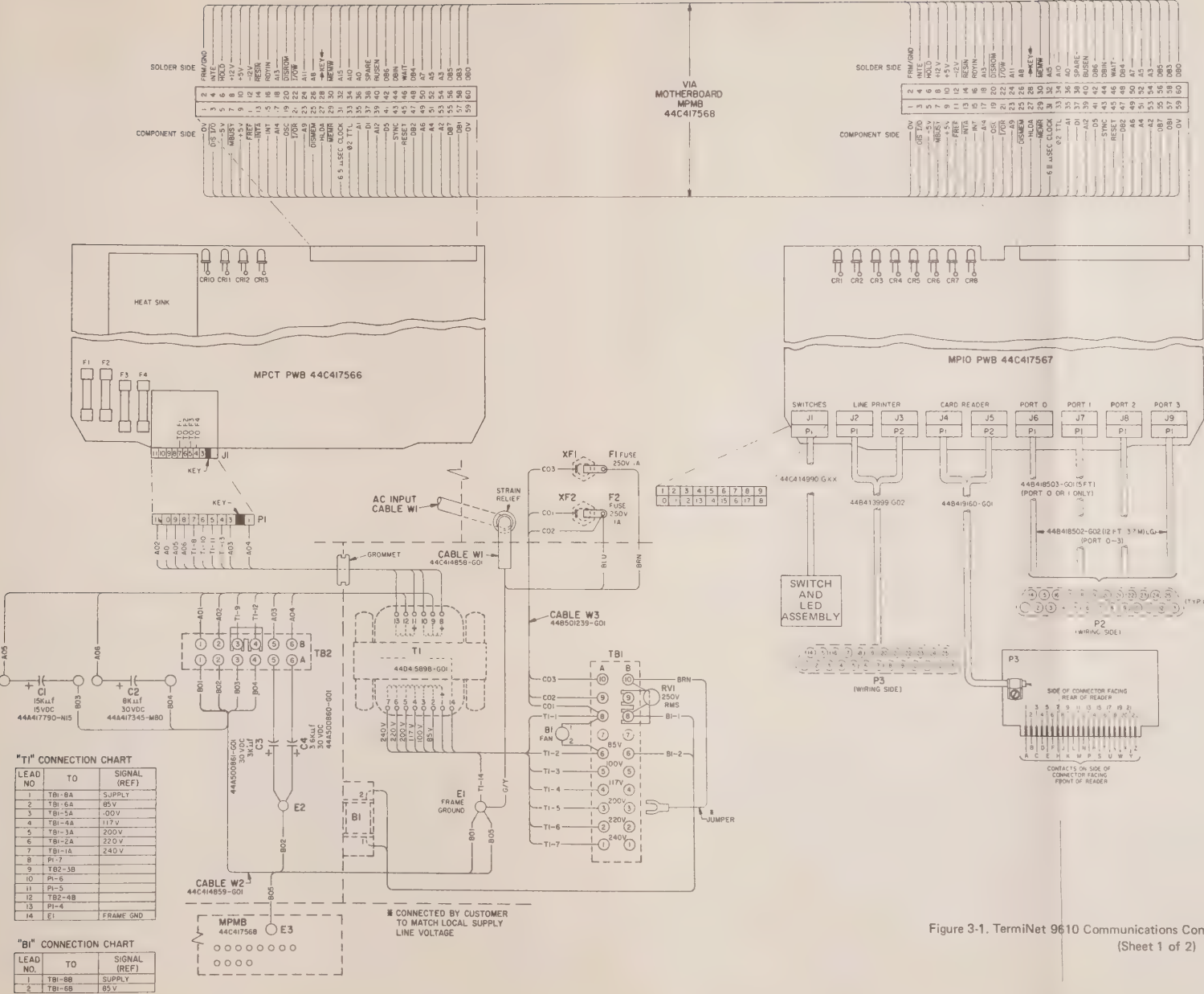
board input-output signals is also included in Figure 3-1. This table provides signal descriptions and pin locations. Terminal strips, power supply details (transformer, power capacitors, fusing), fan connections, etc., are included to assist in Troubleshooting.

The following Troubleshooting Guide is provided to match malfunction symptoms against a list of possible causes.

TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE
No power (No indication on either the 5V or 12V LED)	1. AC power cord or source disconnected. 2. Primary fuse F1 blown. 3. Primary fuse F1 or F2 blown on units jumpered for operation where both sides of AC line are fused. 4. Primary transformer jumper TB1 not connected (See drawing 44C401594).
5V LED OFF	1. Fuse F3, F4 blown*. 2. MPCT 3. Power transformer 4. Capacitor C1, C4 (main assembly)
WAIT LED ON 12V LED OFF	1. F1, F2 blown*. 2. MPCT 3. Power transformer 4. Capacitor C2, C3
One peripheral device operates improperly. (This assumes appropriate tests were made of the device)	1. Strapping on MPIO 2. MPIO 3. Associated interface cable 4. MPCT
System Inoperative	1. MPCT 2. MPIO 3. MPEM 4. Program A. Not loaded B. Loaded incorrectly C. Program Tape (RAM system)

*If the controller is powered up under no load conditions (program not running and no peripheral devices connected) one fuse may be blown while a POWER ON indication is still provided on the 5V and 12V LED's.



TCC-7004-1

Figure 3-1. Terminet 9610 Communications Controller Interconnection Diagram (Sheet 1 of 2)

Troubleshooting

SIGNAL LIST

SIGNAL	DESCRIPTION	SIGNAL	DESCRIPTION
ANS	Answerback	MON	Motor On
BELL	Bell	PER	Parity Error
CCOND	Check condition from Card Reader	PICK	Pick Card to Card Reader
CIS	Card in station from Card Reader	PON	Power On
CTS (CB)	Clear To Send	RCLK	Receive Clock
DAV	Data Available From Card Reader	RD (BB)	Receive Data
D80-7	System Data Bus 0-7	RFP	Ready From Printer
DSR (CC)	Data Set Ready	ROW0-T2	Card Reader Row Data
DTR (CD)	Data Terminal Ready	RTP	Ready To Print
FAULT	Fault Signal	RTS (CA)	Request To Send
FRMGND (AA)	Frame Ground	ROA-R3A	Spare A Output Signal (Ports 0-3)
		ROB-R3B	Spare B Output Signal (Ports 0-3)
		TCLK	Transmit Clock
HALT	Halt From Card Reader	TD (BA)	Transmit Data
IND0-7	Indicator (LED) 0-7	TDS	Transmit Data Bus
INT	Interrupt	TDS	Transmit Data Spare
INTLK	Interlock from Card Reader	TRAN	Transfer
LPFP	Low Paper From Printer	X0A, X0B	Spare Output Signals (Port 0)
MDIS	Motor Interface to Card Reader	X1A, X1B	Spare Output Signals (Port 1)
M+F	Motor or Paper Feed	OV (AB)	Signal Ground
MOF	Motor Off	+5V (AB)	+5 Volts

PIN LOCATIONS

	SWITCHES & LEDS	LINE PRINTER			CARD READER	PORT 0	PORT 1	PORT 2	PORT 3
PIN	J1	J2	J3	J4	J5	J6	J7	J8	J9
1	OV	OV		OV		TD	TD	TD	TD
2	CR6	FRM	PON	OV		CTS	CTS	CTS	CTS
3	CR5	TDB1	BELL	OV		RTS	RTS	RTS	RTS
4	SW4	TDB2	RFP		MDIS	ROB	R1B	R2B	R3B
5	SW3		RTP	OV	PICK	ROA	RTA	R2A	R3A
6	SW2	TDB4	ANS	ROW1		XOA	X1A		
7	+5V	TDB5	TRAN	ROW2					
8	SW1	TDB6	TDS	ROW3	HALT				
9	SW0	TDB7	FAULT	ROW4		DSR	DSR	DSR	DSR
10	CR3	TDB3	TDB8	FRM	ROW9	FRM	FRM	FRM	FRM
				GND		GND	GND	GND	GND
11	CR2		M+F	ROW12		RD	RD	RD	RD
12	CR1		INT	ROW11		DTR	DTR	DTR	DTR
13	CR0		MON	ROW0		OV	OV	OV	OV
14	CR4		PER	ROW5		X0B	X1B		
15	SW7		LPFP		DAV				
16	SW6		MOF	ROW6	INTLK				
17	CR7			ROW7	CCOND	TCLK	TCLK		
18	SW5			ROW8	CIS	RCLK	RCLK		

MPSL SWITCHES AND LEDS CABLE

44C414990-GXX

WIRE COLOR	CABLE END 1	CABLE END 2
WHITE	P1-01	OV
WHITE/BLACK	P1-02	CR6
WHITE/BROWN	P1-03	CR5
WHITE/RED	P1-04	SW4
WHITE/ORANGE	P1-05	SW3
WHITE/YELLOW	P1-06	SW2
WHITE/GREEN	P1-07	+5V
WHITE/BLUE	P1-08	SW1
WHITE/VIOLET	P1-09	SW0
WHITE/GRAY	P1-10	CR3
WH/BLK/BWN	P1-11	CR2
WH/BLK/RED	P1-12	CR1
WH/BLK/ORANGE	P1-13	CR0
WH/BLK/YELLOW	P1-14	CR4
WH/BLK/GRN	P1-15	SW7
WH/BLK/BLUE	P1-16	SW6
WH/BLK/VIOLET	P1-17	CR7
WH/BLK/GRAY	P1-18	SW5

PRINTER CABLE

44B418502-G01, -G02

WIRE COLOR	FROM	TO	SIGNAL (REF)
DRAIN	P2-1	P1-10	FRM GND
WHT BLK	P2-2	P1-11	X DATA (TD)
WHT BRN	P2-3	P1-1	R DATA (RD)
WHT RED	P2-4	P1-2	RTS
WHT ORN	P2-5	P1-3	CTS
WHT YEL	P2-6	P1-12	DSR
WHT GRN	P2-7	P1-13	OV
WHT BRN-ORN	P2-20	P1-9	DTR

DATA SET CABLE

44B418503-G01

WIRE COLOR	FROM	TO	SIGNAL (REF)
DRAIN	P2-1	P1-10	FRM GND
WHT BLK	P2-2	P1-1	X DATA (TD)
WHT BRN	P2-3	P1-11	R DATA (RD)
WHT RED	P2-4	P1-3	RTS
WHT ORN	P2-5	P1-2	CTS
WHT YEL	P2-6	P1-9	DSR
WHT GRN	P2-7	P1-13	OV
WHT BLU	P2-8	P1-4	CARDET (ROB, RTB, R2B, R3B)
WHT BLK-GRN	P2-15	P1-17	TCL (TCLK)
WHT BLK-VIO	P2-17	P1-18	RCL (RCLK)
WHT BRN-ORN	P2-20	P1-12	DTR
WHT BRN-YEL	P2-21	P1-14	SPARE (X0B, X1B)
WHT BRN-GRN	P2-22	P1-5	SPARE (ROA, R1A, R2A, R3A)

CARD READER INTERFACE CABLE

44B419160-G01

WIRE COLOR	FROM	TO	SIGNAL (REF)
WHT	P3-1	P2-18	CIS
WHT BLK	P3-2	P2-15	DAV
WHT BRN	P3-3	P2-17	CKCOND
WHT RED	P3-4	P2-16	INTLK
WHT ORN	P3-6	P2-5	PICK
WHT YEL	P3-11	P1-11	BIT12**
WHT GRN	P3-12	P1-12	BIT11**
WHT BLU	P3-13	P1-13	BIT0**
WHT VIO	P3-14	P1-6	BIT1**
WHT GRY	P3-15	P1-7	BIT2**
WHT BLK-BRN	P3-16	P1-8	BIT3**
WHT BLK-RED	P3-17	P1-9	BIT4**
WHT BLK-ORN	P3-18	P1-14	BIT5**
WHT BLK-YEL	P3-19	P1-16	BIT6**
WHT BLK GRN	P3-20	P1-17	BIT7**
WHT BLK-BLU	P3-21	P1-18	BIT8**
WHT BLK-VIO	P3-22	P2-10	BIT9**
WHT BLK-GRY	P3-A	P2-4	MDIS
WHT BRN-RED	P3-T	P2-9	SPARE1
WHT BRN-ORN	P3-W	P2-8	HALT
WHT BRN-YEL	P3-Z	P2-14	SPARE2
WHT BRN-GRN	P3-0V*	P1-1	OV
WHT BRN-BLU	P3-0V*	P1-2	OV
WHT BRN-VIO	P3-0V*	P1-3	OV
WHT BRN-GRY	P3-0V*	P1-5	OV
DRAIN	P3-0V*	P1-10	FRMGND

LINE PRINTER

PARALLEL INTERFACE CABLE

44B413999-G01

WIRE COLOR	FROM	TO	SIGNAL (REF)
DRAIN	P3-1	P1-2	AA
WHT BLK	P3-2	P1-4	TDB2
WHT BRN	P3-3	P1-10	TDB3
WHT RED	P3-4	P2-13	C5
WHT ORN	P3-5	P2-2	S4
WHT YEL	P3-6	P2-5	C8
WHT GRN	P3-7	P1-1	OV
WHT BLU	P3-8	P1-6	TDB4
WHT VIO	P3-9	P2-12	S7
WHT GRY	P3-10	P2-6	S2
WHT BLK BRN	P3-11	P1-3	TDB1
WHT BLK-RED	P3-12	P1-8	TDB6
WHT BLK-YEL	P3-14	P1-9	TDB7
WHT BLK-GRN	P3-15	P1-11	C2
WHT BLK-BLU	P3-16	P2-10	TDB8
WHT BLK-VIO	P3-17	P2-11	S8
WHT BLK GRY	P3-18	P1-7	TDB5
WHT BRN-RED	P3-19	P2-16	C6
WHT BRN-ORN	P3-20	P2-4	S3
WHT BRN-YEL	P3-21	P2-14	S6
WHT BRN GRN	P3-22	P2-3	C7
WHT BRN-BLU	P3-23	P2-7	C4
WHT BRN VIO	P3-24	P2-8	C1
WHT BRN-GRY	P3-25	P2-15	S5

*P3-8, P3-9, P3-10, P3-U, P3-V

**BIT Signal is designated ROW on MPIO J4 and J5 connectors.

TCC-7004-2

Figure 3-1. TerminiNet 9610 Communications Controller Interconnection Diagram (Sheet 2 of 2)

TABLE 3-1
FUSE CHART

LOCATION	DESIGNATION	PART NUMBER	VALUE	TYPE
MPCT Printed Wiring Board	F1, F2	K9774741P16	1.5A at 250V	MDX
	F3, F4	K9774741P14	3A at 125V	MDX
Lower Rear of Controller Box Adjacent to PWR TRANS	F1, F2	K9774741P13	1A at 250V	MDL
Domestic AC Switch Box	----	44A418359-002	10A at 250V	3AB

When a fault is suspected to exist, the first step in its isolation is to verify power supply operation. Proper power supply voltages are indicated by lit LED's on the Microprocessor and Control MPCT printed wiring board. Refer to Figure 3-2 for location of 5 and 12 volt indicators (LED's).

Figure 3-2 also shows the location of the four fuses which are located on the MPCT board. Table 3-1 lists the fuses used in the TerminiNet 9610 Communications Controller, together with designation, part number, value, and type.

Unused pins on the Mother Board may be used as voltage and signal test points. The pins are in parallel and marked at intervals on the Mother Board (i.e., 1 and 2, 19 and 20, 39 and 40, 59 and 60) to facilitate locating the desired pin for testing.

MICROPROCESSOR AND CONTROL BOARD MPCT-44C417566

DESCRIPTION

The MPCT printed wiring board contains most of the power supply, including full wave center tap rectifiers, IC regulators, and LED indicators for the 5V and 12V power supplies, and the WAIT and HOLD signals (see Figure 3-2). It also contains the low voltage detector, three control processor chips (8080A CPU, 8228 bus driver, and 8224 clock generator), ROM and RAM circuitry and address decoder, and RAM driver circuitry.

Power is delivered to the MPCT board from the two secondaries of the chassis mounted transformer through an 11-pin connector (J1). The secondaries are center tapped, and each half of each winding is

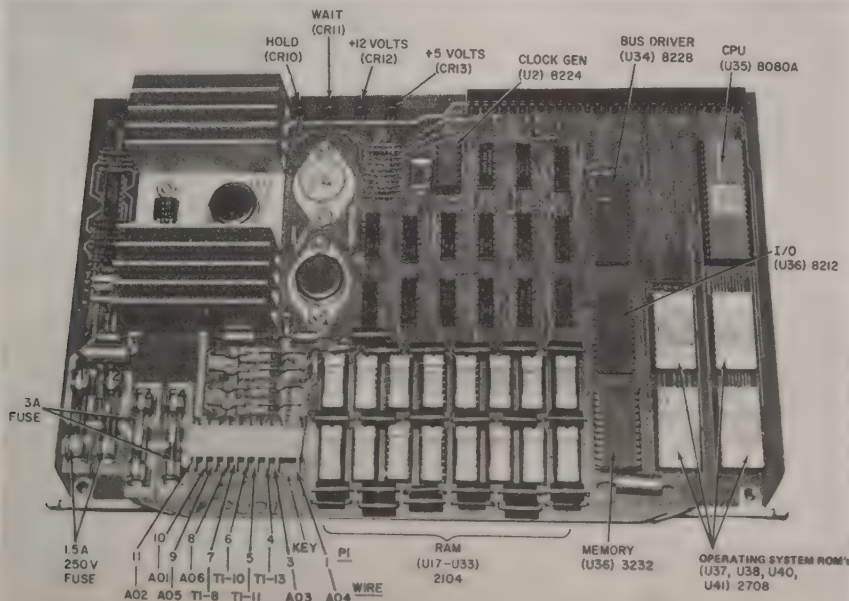
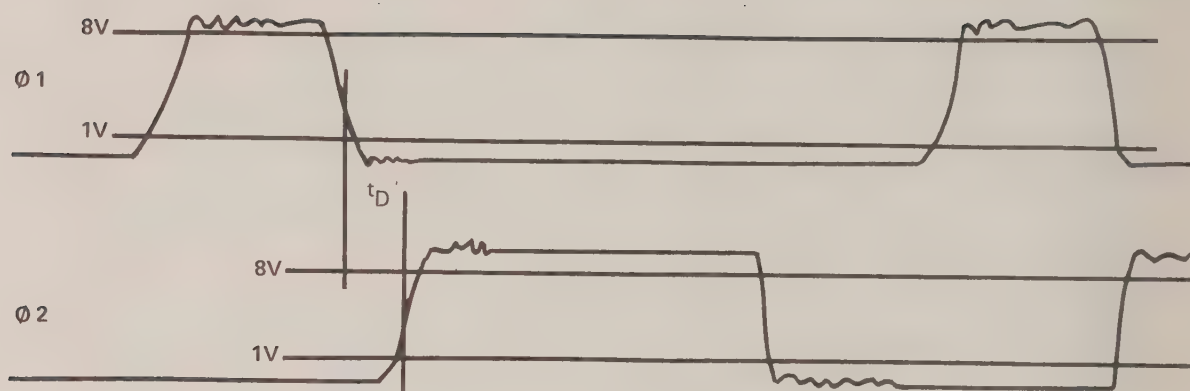


Figure 3-2. Microprocessor and Control (MPCT) Printed Wiring Board



1. Clock Low Voltage
2. Clock High Voltage
3. Clock Period
4. Clock Rise and Fall Time
5. Delay Ø1 to Ø2 (t_D)

Minimum

-1
9
498
0
0

Maximum

.8V
+12V REG +1V
502 NSEC
50 NSEC
--- NSEC

CAUTION

Care should be exercised in observing these signals as Ø1 and Ø2 (pins 10 and 11 of the clock generator U2) do not have short circuit protection.

Figure 3-3. Clock Generator Wave Forms

TCC-7012

fused (F1-F4). After passing through the fuses, the secondaries feed four regulator circuits which develop +12, +5, -5, and -12V DC supply voltages.

Heat generated in the +12 and +5 volt regulators is dissipated through an extruded heat sink.

TEST POINTS

As mentioned above under GENERAL INFORMATION, Mother Board pins are located in parallel and numbered at intervals. Therefore, these are used as test points.

CLOCK GENERATOR WAVE FORMS

The waveforms of the Ø1 and Ø2 clock signals can be observed at pins 22 and 15, respectively, of the CPU 8080A chip (U35). The waveforms should conform to the specifications shown in Figure 3-3.

FUSES

The MPCT board has four fuses. See Table 3-1 and Figure 3-2.

STRAPPING OPTIONS

None.

ENGINEERING DRAWINGS

MPCT Elementary 44C401579 (See Chapter 6)
Power Elementary 44C401594 (See Chapter 6)
MPCT Assembly 44C417566 (See Figure 5-4)

MPCT FUNCTIONS

1. Accepts and fuses power leads from main transformer secondary and develops regulated $\pm 5V$ and $\pm 12V$ DC supplies for controller use.
2. Provides low voltage detection for +12 and $\pm 5V$ DC supplies. Provides a valid $\overline{RESIN}$ signal as long as the +12 volt supply is at +3 volts or higher.
3. Includes the central processing unit U35 (8080A chip) with clock generator U2 (8224 chip) and bus driver U34 (8228 chip) in standard, manufacturer suggested configuration.
4. Contains address decoder circuitry including U5 and U11 chips next to the bus driver. These chips address the controller ROM consisting of four socket-mounted 2708 PROM chips (U37, U38, U40, U41).

5. Provides 8K RAM on sixteen 2104 chips (U18-U33) on MCPT/2 and associated RAM driver circuitry.

MICROPROCESSOR INPUT/OUTPUT BOARD

MPIO - 44C417567

DESCRIPTION (See Figure 3-4)

The MPIO printed wiring board contains the address decoder (U101 and U80) for the I/O devices, interrupt controller (U91), timed interrupt and baud clock (U111), serial ports (U92, 112, 121 and 131), output to line printer interface (U51), and card reader input/output (U71). Also eight LED's are provided which are driven by an eight-bit latch which stores data from the data bus when addressed ("1" condition = LED off). Provision is optionally made by means of strap J10 to supply +5V to drive either the on-board LED's (J10 In) or external LED's (J10 Out).

The address decoder is activated during input/output machine cycles and during memory reference machine cycles which access the I/O region of memory. The interrupt controller accepts multilevel interrupts from the various I/O and timing signals connected to it and, in turn, interrupts the 8080A, causing it to branch to the appropriate service routine. The timed interrupt and baud rate generator consists of a divide-by-eight counter and an LSI chip. Of the four serial ports available, two operate asynchronously only, and the remaining two ports (designated 0 and 1) operate either asynchronously or synchronously.

The line printer port is designed to interface the TermiNet 120 and 340 family of printers through the

INT/1 or INT/2 board. It outputs an eight-bit data word and associated strobe as well as a five bit command word to the printer, and it receives eight bits of status from the printer. The card reader port is designed to interface with a Hollerith code card reader. It receives twelve bits of card column information with associated strobe and four bits of status from the reader; it outputs two command signals to the reader.

Thirty-two switches (four 8-pole, single throw dip switches) whose state can be read under program con-

trol are included on the MPIO/1 board in order to provide a means of implementing field selectable options in software.

Eight LED's are provided on MPIO/1 to indicate operational status information. Normally, the LED's are not visible to the operator. An external LED box is optionally available.

TEST POINTS

As mentioned under GENERAL INFORMATION, Mother Board pins are located in parallel and numbered at intervals. Therefore, these are used as test points.

FUSES

None.

STRAPPING OPTIONS

There are eleven movable straps on the MPIO/1 printed wiring board to select various modes of operation of the ports. Refer to System Configuration Instructions for TermiNet 9610 Remote Processing System (GEK-49327) for specific strapping requirements. Refer to Figure 3-4 for strap locations.

ENGINEERING DRAWINGS

MPIO Elementary:	44C401580 (See Chapter 6)
MPIO Assembly:	44C417567 (See Figure 5-5)

MPIO FUNCTIONS

1. Provides address decoder for the I/O device.
2. Includes the interrupt controller.
3. Contains the timed interrupt and baud rate generator.
4. Provides four serial ports: two asynchronous only, and two which are asynchronous or synchronous.
5. Provides a line printer port.
6. Provides a card reader port.
7. Provides four switch bytes.
8. Includes an LED display and driver.

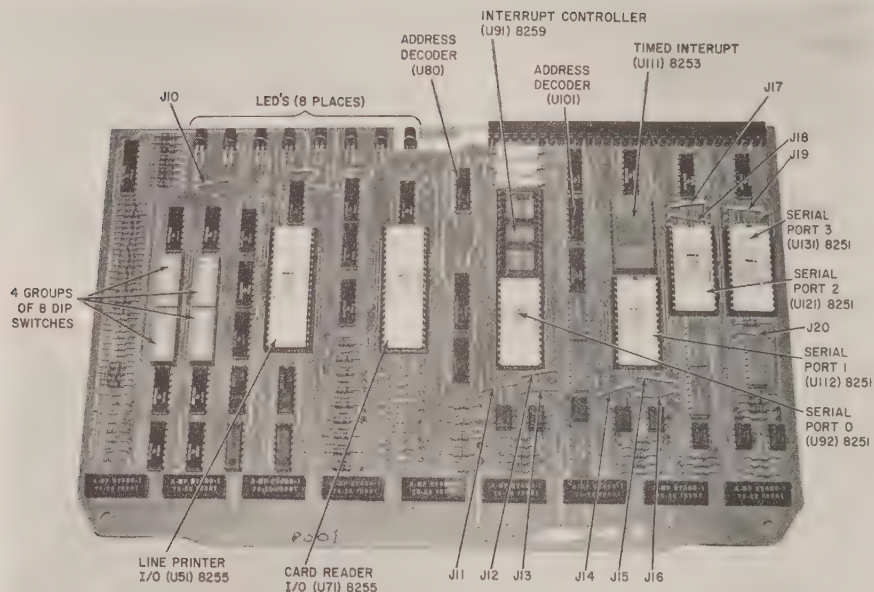


Figure 3-4. Microprocessor Input/Output (MPIO) Printed Wiring Board

TCC-7006

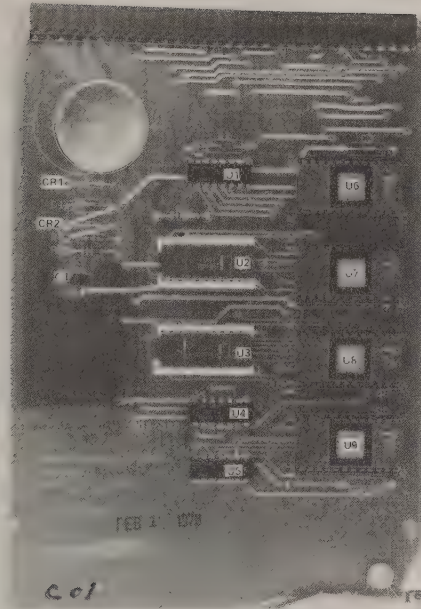


Figure 3-5. Microprocessor Extended Memory (MPEM) Printed Wiring Board

TCC-8001

MICROPROCESSOR EXTENDED MEMORY BOARD (MPEM)

DESCRIPTION (See Figure 2-5)

The MPEM board provides PROM and nonvolatile RAM storage. The PROMs used are 2716s and the RAMs are low-power CMOS, 5101L-1 RAMs with battery backup.

The PROMs occupy addresses 1000 to 2FFF. Decoding of enables for the PROMs is done by U1. All U1 outputs are held high (all PROMs in standby) if either A14 or A15 is high (address above 4000). If A15 and A14 are both low, the enable signals are further gated by U1, so that no memory is enabled if $\overline{\text{DISMEM}}$ is low. Under the conditions that A14 and A15 are both low and $\overline{\text{DISMEM}}$ is one, the memory is enabled according to the table below:

Address Range	A13	A12	A11	Output Low	Memory Enabled
1000-17FF	0	1	0	Y2	U6 PROM
1800-1FFF	0	1	1	Y3	U7 PROM
2000-27FF	1	0	0	Y4	U8 PROM
2800-2FFF	1	0	1	Y5	U9 PROM
3F00-3FFF	1	1	1	Y7	U2-U3 RAM

For a given PROM to be selected, it must be enabled (pin 18 must be zero) and it must be selected (pin 20 must be zero). When $\overline{\text{MEMR}}$ goes low, the chip selects of all four PROMs go low and the PROM which is enabled puts its contents onto the data bus. $\overline{\text{MEMR}}$ is gated with $\overline{\text{DISROM}}$ so that no PROMs are selected if $\overline{\text{DISROM}}$ is zero.

There are 256 bytes of RAM in the two 5101L-1 RAMs. The RAMs are selected when the Y7 output of U1 is zero and A10, A9 and A8 are 1. The read/write input is controlled by $\overline{\text{MEMW}}$ and the output disable input is controlled by $\overline{\text{MEMR}}$. Thus, when both $\overline{\text{MEMR}}$ and $\overline{\text{MEMW}}$ are 1, the output is disabled and the read mode is selected. If $\overline{\text{MEMR}}$ goes to 0 (the processor is reading from the RAM), the output is enabled and the RAM drives the data bus. If $\overline{\text{MEMR}}$ is 1 and $\overline{\text{MEMW}}$ is 0 (the processor is writing to memory), the outputs are disabled so that the processor can drive the data bus and the data is written into the RAMs.

A 2.8 volt, long-life battery supplies the RAM with at least 2 volts when power is removed from the board. Q1 controls the power supply to the RAMs. If the +12 volt and +5 volt supplies are on, CR2 is on, Q1 is on, and CR1 is off. In this case, the power for the RAMs comes from the 12 volt supply through Q1,

with the 5 volt supply used as a reference. If the power supplies are off, CR1 is on, Q1 and CR2 are off, and power flows from the battery to the RAMs. This power supply is sufficient to hold the data in the RAMs for the life of the battery. Chip enable 2 (CE2) of the RAMs is tied to RESIN to prevent the RAMs from being enabled and possibly written into when the power supplies are low.

TEST POINTS

None.

STRAPPING OPTIONS

None.

FUSES

None.

ENGINEERING DRAWINGS

MPEM Elementary: 44C402403 (See Chapter 6)

MPEM Assembly: 44B418282-G01 (See Figure 5-6)

MPEM FUNCTIONS

Provides PROM and RAM memory.

CHAPTER 4

PARTS REPLACEMENT

PRINTED WIRING BOARDS

The MPCT and MPEM printed wiring boards are initially freed from the Mother Board connectors by means of board extractors (after first disconnecting the power harness from the front of the board). Be sure to exert equal pressure on both sides of the MPCT board to avoid uneven removal and possible pin bending. The 5x7 in. MPEM board has only one extractor, but is easily removable by pulling straight out after loosening with the extractor. Once the boards are free of the connectors, they can be pulled straight out from the guide tracks with a firm, steady pressure. The MPIO board is not equipped with board extractors due to space limitations. However, it can be removed by pulling straight out carefully to disengage the connectors without bending pins. Continue pulling steadily and evenly until free of the guide tracks, as was done in removing the MPCT and MPEM boards.

Before replacing the MPCT board, check that all ROM's are tight in their sockets (see Figure 3-2). When replacing any board, be sure the edges line up with both the top and bottom tracks. Ease the board into the frame until the connectors mate, then firmly seat the board into its Mother Board connection.

CAUTION

Exercise care during replacement to insure the connector pins are not damaged.

Only fuses and power supply filter capacitors are field replaceable components. For other defective components, replace boards and/or cables. (See Figures 3-2, 3-4, 3-5, 5-4, 5-5 and 5-6).

COOLING FAN

The Cooling Fan Assembly (44B501240-G01) is secured in place by means of screws, lockwashers, washers and nuts attaching the fan guard to the Communications Controller structure in four places. The two cooling fan power wires are routed to the connector strip near the bottom of the Controller Assembly.

To replace the cooling fan, proceed as follows:

1. Remove Communication Controller Assembly from Pedestal.
2. Remove MPCT and MPIO printed wiring boards.

3. Disconnect the two black fan power wires at the connector strip end.
4. Insert screwdriver between board supports into center of fan and remove the two protruding screws (not the two countersunk ones) which secure the fan blade to the fan motor shaft.
5. Remove the two screws and washers which secure the fan motor to the fan blade guard.
6. Lift out the fan motor.
7. Slide the plastic fan blade out of the fan guard.

NOTE

This can be easily done without stressing or binding the fan blade by sliding the fan blade down between the guards and removing it at a slight angle.

Replace or reinstall the cooling fan by performing steps 4 through 7 in reverse order. Be sure to secure the motor to the fan blade guard before attaching the fan blade to the motor shaft as this is much easier than the reverse.

MOTHER BOARD

To replace Mother Board (MPMB, Part Number 44C417568-G01), proceed as follows:

1. Remove Communications Controller Assembly from Pedestal.
2. Disconnect all connectors from printed wiring boards and remove boards from controller assembly.
3. Disconnect ground wire from Mother Board (in back of capacitors).
4. Remove eight screws securing end and center circuit board supports to base of Communications Controller.
5. Lift out Mother Board and, if required, disconnect the three board supports from Mother

Board by removing nine screws (four at upper end support, two at center support, and three at lower [fan] end support).

Replace or reinstall Mother Board by performing steps 1 through 5 in reverse order.

NOTE

Be sure a star washer is placed on both sides of the ring terminal when reattaching the ground strap to the Mother Board as shown in Figure 5-2, Sheet 1, View A.

CHAPTER 5

REPLACEMENT PARTS

INTRODUCTION

This chapter contains an illustrated parts listing for the TermiNet 9610 Communications Controller.

Generally, an illustration is located adjacent to the tabular list of parts associated therewith. The tabulated listing includes:

Figure Number

Number of item indicated on figure

Drawing Number (i.e., Part Number)

Description

Cross-referencing to higher or lower assemblies is noted throughout the chapter.

ORDERING SPARE PARTS

When ordering Spare Parts for your TermiNet Communications Controller, be sure to include the following:

Quantity

Drawing Number

Description of each Part Ordered

GEK-49301 (the publication number of this Parts Manual)

Individual Parts may be ordered from:

General Electric Company
Data Communication Products Department
Parts and Administration Unit
Waynesboro, Virginia 22980

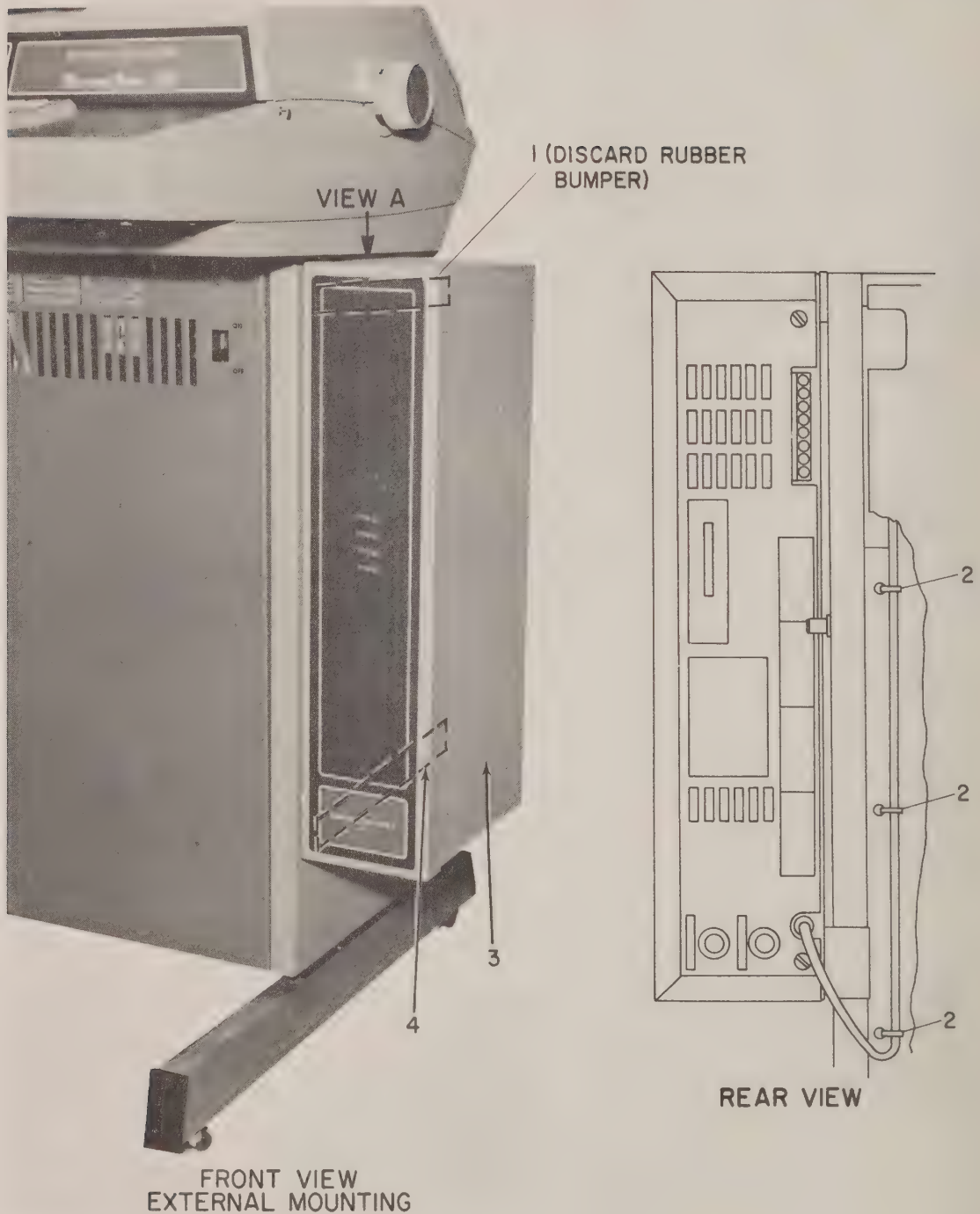


Figure 5-1. TermiNet 9610 Communications Controller Mounting Configuration (Sheet 1 of 3)

TCC-7007-1

NOTE

Controller 44D415897-G01 has optional special mounting inside pedestal for use with TermiNet 340 Printer.
 Controller 44D415897-G02 has standard preferred mounting on outside of pedestal for use with TermiNet 340 Printer.
 Controller 44D415897-G03 has optional special mounting inside pedestal for use with TermiNet 300 or 1200 Printer (domestic power).
 Controller 44D415897-G04 has standard preferred mounting on outside of pedestal for use with TermiNet 300 or 1200 Printer (international power).
 Controller 44D415897-G05 has optional special mounting inside pedestal for use with TermiNet 30 Printer.
 Controller 44D415897-G06 has standard preferred mounting on outside of pedestal for use with TermiNet 30 Printer.

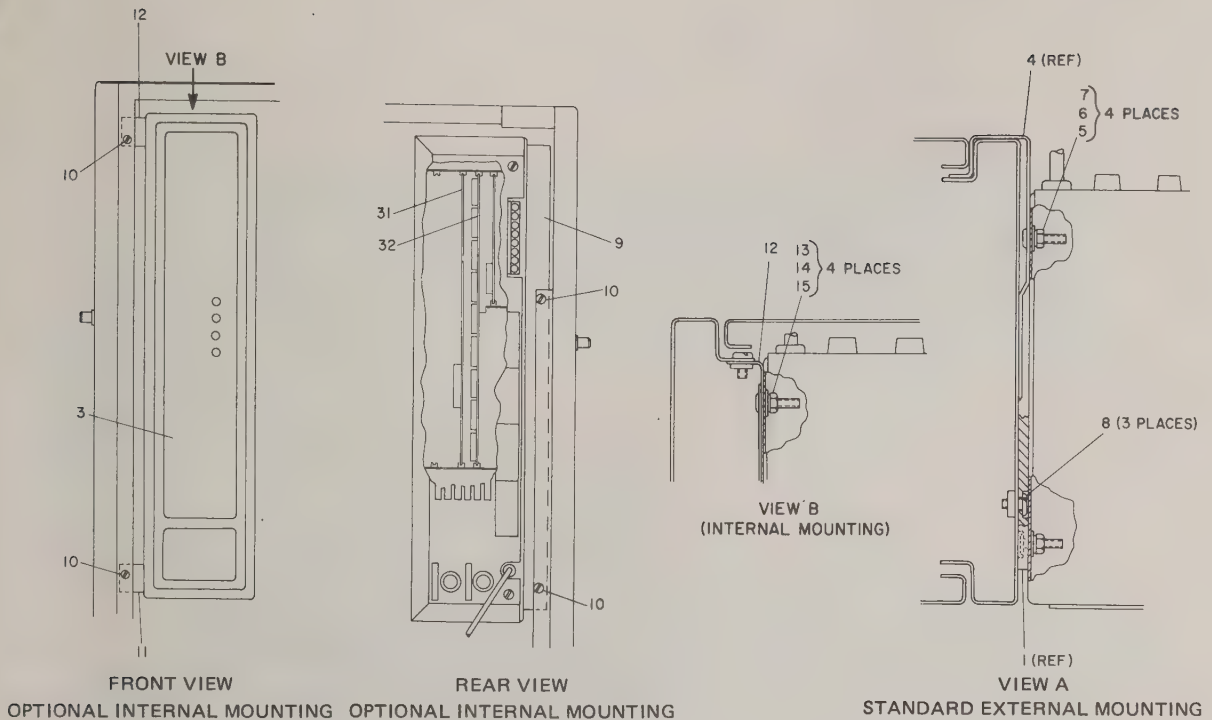
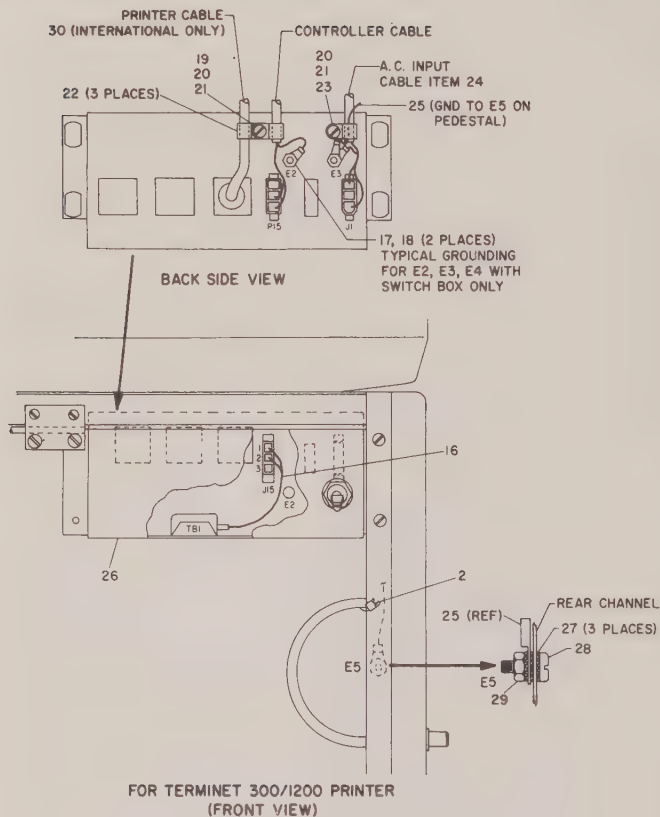


Figure 5-1. TerminiNet 9610 Communications Controller (Sheet 2 of 3)

TCC-7007-2

FIG.	ITEM	DRAWING	DESCRIPTION	CAN BE REPLACED BY THE FOLLOWING PART
5-1	1	44B501231-001	Bar Assembly (1)	
	2	44A417098-001	Cable Tie (1 Req'd (3, 5, 7); 4 Req'd (4, 8); 2 Req'd (6)	
	3	44D415896-G01	Domestic Controller (Burnt Orange, standard; see Figure 5-2 for details) (2)	
	3	44D415896-G02	Domestic Controller (Precision Blue, option; see Figure 5-2 for details) (2)	
	3	44D415896-G03	Domestic Controller (Royal Green, option; see Figure 5-2 for details) (2)	
	3	44D415896-G04	Multivoltage (International) Controller (Burnt Orange, standard; see Figure 5-2 for details) (2)	
	3	44D415896-G05	Multivoltage (International) Controller (Precision Blue, option; see Figure 5-2 for details) (2)	
	3	44D415896-G06	Multivoltage (International) Controller (Royal Green, option; see Figure 5-3 for details) (2)	
	4	44B501243-G01	Safety Strap (1)	
	5	N402P38C	Washer (4 Req'd) (1)	Plain washer, steel, No. 8
	6	N405P8C	Lockwasher (4 Req'd) (1)	Lockwasher, steel, No. 8
	7	N210P15C	Nut (4 Req'd) (1)	Hex Nut, steel, No. 8-32
	8	N57P16006C	Screw (3 Req'd) (1)	Pan Hd Screw, steel, No. 10-32x3/8
	9	44B501244-G01	Rear Support (3,5,7)	
	10	N57P16006C	Screw (4 Req'd) (3,5,7)	Pan Hd Screw, steel, No. 10-32x3/8
	11	44B501245-G01	Bottom Bracket (3,5,7)	
	12	44B510246-G01	Top Bracket (3,5,7)	
	13	N402P38C	Washer (4 Req'd) (3,5,7)	Plain washer, steel, No. 8
	14	N405P8C	Lockwasher (4 Req'd) (3,5,7)	Lockwasher, steel, No. 8
	15	N210P15C	Nut (4 Req'd) (3,5,7)	Hex Nut, steel, No. 8-32
	16	44A411409-G04	Cable Assembly (5,6,7,8) (or as req'd, see Note 2)	

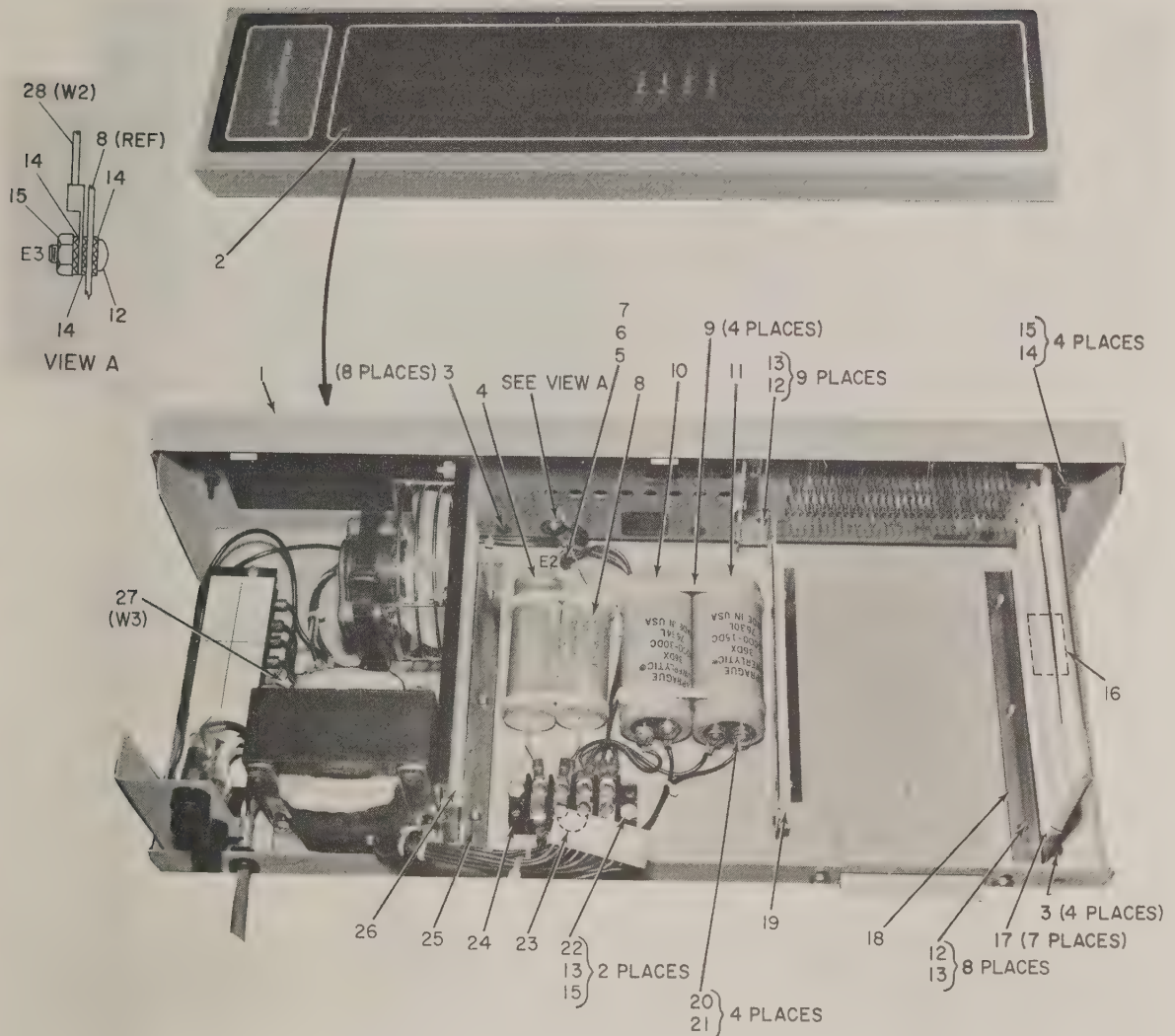


TCC-7007-3
Figure 5-1. TermiNet 9610 Communications
Controller (Sheet 3 of 3)

FIG.	ITEM	DRAWING	DESCRIPTION	CAN BE REPLACED BY THE FOLLOWING PART
5-1	17	N210P13C	Nut (2 Req'd on -G03; 3 Req'd on -G04)	Hex Nut, steel, No. 6-32 Ext. Tooth Lockwasher, steel, No. 6 Pan Hd Screw, steel, No. 6-32x½ Lockwasher, steel, No. 6 Plain Washer, steel, No. 6 ¼ Cable Clamp, Nylon Pan Hd Screw, steel, No. 6-31x3/8 Ext. Tooth Lockwasher, steel, No. 10 Pan Hd Screw, steel, No. 10-32x½ Hex Nut, steel, No. 10-32
	18	N403P13C	Lockwasher (4 Req'd on -G03; 6 Req'd on -G04)	
	19	N57P13008C	Screw (5, 6)	
	20	N405P7C	Lockwasher (2 Req'd) (5, 6)	
	21	N402P7C	Washer (2 Req'd) (5, 6)	
	22	N915P4	Cable Clamp (3 Req'd) (5, 6)	
	23	N57P13006C	Screw (5, 6)	
	24	44B412963-G02	AC Cable Assembly (Domestic) (5)	
	24	44B413755-G02	AC Cable Assembly (International) (6)	
	25	44A411410-G24	Wire Assembly (5, 6)	
	26	44D415854-G01	AC Switch Box (Domestic; see Figure 5-3 for details) (5)	
	26	44D415854-G02	AC Switch Box (International; see Figure 5-3 for details) (6)	
	27	N403P19C	Lockwasher (3 Req'd) (5, 6)	
	28	N57P16008C	Screw (5, 6)	
	29	N210P16C	Nut (5, 6)	
	30	44A411452-G02	Power Cord (International) (6)	
	31	44C417566-G02	MPCT/2 (8K RAM w/o PROM's) (see Figure 5-4 for details) (2)	
	32	44C417567-G01	MPIO/1 (see Figure 5-5 for details) (2)	
	33	44B418282-G01	MPEM/1 (see Figure 5-6) (2).	
	34	44C414990-GXX	MPSL Switches & LED's Cable Asm. (see Figure 5-7) (2)	

NOTES

- For external mounting on pedestal and use with TermiNet 30 or 340 Printer. Included in Accessory Parts 44D500859-G01 of 44D415897-G02 and 44D415897-G06.
- Included on top assembly, which is numbered as assigned.
- Included with Controller 44D415897-G01.
- Included with Controller 44D415897-G02.
- Included with Controller 44D415897-G03.
- Included with Controller 44D415897-G04.
- Included with Controller 44D415897-G05.
- Included with Controller 44D415897-G06.



TCC-7008-1

Figure 5-2. TerminoNet 9610 Communications Controller Subassembly (Sheet 1 of 3)

NOTE

Controller Subassembly 44D415896-G01 has standard burnt orange accent color. (Domestic)
 Controller Subassembly 44D415896-G02 has optional precision blue accent color. (Domestic)
 Controller Subassembly 44D415896-G03 has optional royal green accent color. (Domestic)
 Controller Subassembly 44D415896-G04 has standard burnt orange accent color. (Multivoltage, International)
 Controller Subassembly 44D415896-G05 has optional precision blue accent color. (Multivoltage, International)
 Controller Subassembly 44D415896-G06 has optional royal green accent color. (Multivoltage, International)

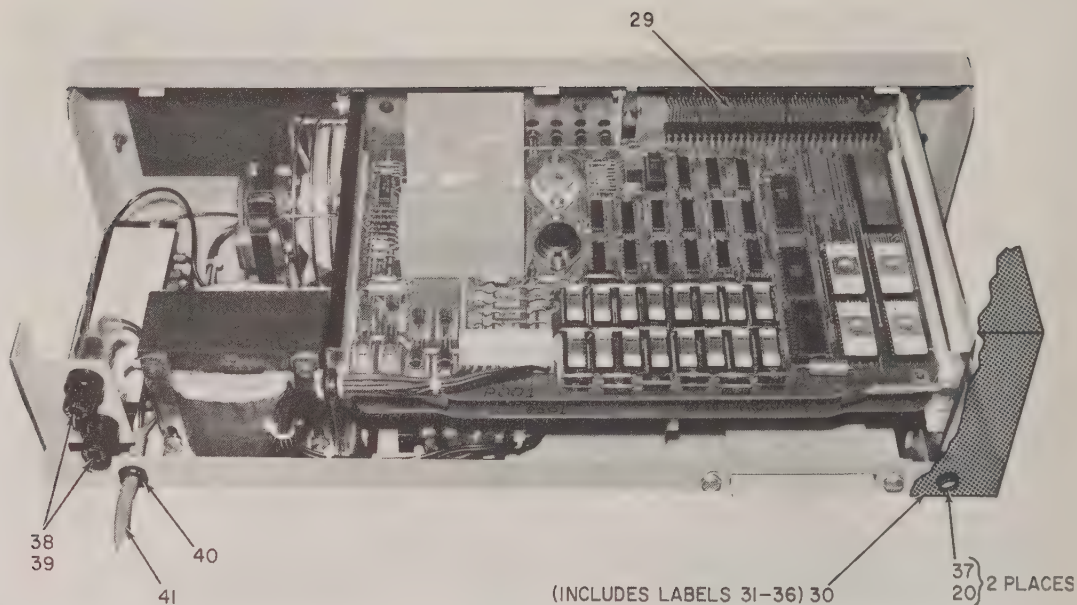


Figure 5-2. TerminoNet 9610 Communications Controller Subassembly (Sheet 2 of 3)

TCC-7008-2

FIG.	ITEM	DRAWING	DESCRIPTION	CAN BE REPLACED BY THE FOLLOWING PART
5-2	1	44D415894-G01	Chassis	
	2	44C414856-G01	Front Panel (standard, burnt orange) (1) (on -G01 & -G04 asm.)	
	2	44C414856-G02	Front Panel (optional precision blue) (1) (on -G02 & -G05 asm.)	
	2	44C414856-G03	Front Panel (optional royal green) (1) (on -G03 & -G06 asm.)	
	3	44A417792-002	Grommet Bumper (12 Req'd)	
	4	44A500860-G01	Capacitor, 3.6 Kuf (C4)	
	5	44A418311-001	Standoff (at E2)	
	6	N57P9004C	Screw	Pan Hd Screw, steel, No. 4-40x $\frac{1}{4}$
	7	N405P5C	Lockwasher (2 Req'd on -G01, -G04; 1 Req'd on -G02, -G03, -G05, -G06)	Lockwasher, steel, No. 4
	8	44A500861-G01	Capacitor, 3 Kuf (C3)	
	9	44A417098-004	Cable Tie (nylon) (4 Req'd)	
	10	44A501406-M80	Capacitor, 8 Kuf, 30VDC (C2)	
	11	44A501409-N15	Capacitor, 15 Kuf, 15VDC (C1)	
	12	N57P13006C	Screw (22 Req'd)	Pan Hd Screw, steel, No. 6-31x3/8
	13	N405P7C	Lockwasher (27 Req'd)	Lockwasher, steel, No. 6
	14	N403P13C	Lockwasher (11 Req'd)	Ext. Tooth Lockwasher, steel, No. 6
	15	N210P13C	Nut (13 Req'd)	Hex Nut, steel, No. 6-32
	16	N/A	Nameplate	
	17	44C414786-001	Card Guide (7 Req'd)	
	18	44C414851-001	Support	
	19	44B501234-G01	PWB Support	
	20	N57P16006C	Screw (6 Req'd)	Pan Hd Screw, steel, No. 10-32x3/8
	21	N405P9C	Lockwasher (4 Req'd)	Lockwasher, light, steel, No. 10
	22	N57P13010C	Screw (4 Req'd)	Pan Hd Screw, steel, No. 6-32x5/8
	23	V9023301P1	Jumper (4 Req'd)	
	24	N1301P28	Close Back Board (TB 2)	
	25	44C414853-001	Support	
	26	44A500870-001	Card Guide	
	27	44B501239-G01	Cable (W3)	
	28	44C414859-G01	Cable (W2)	

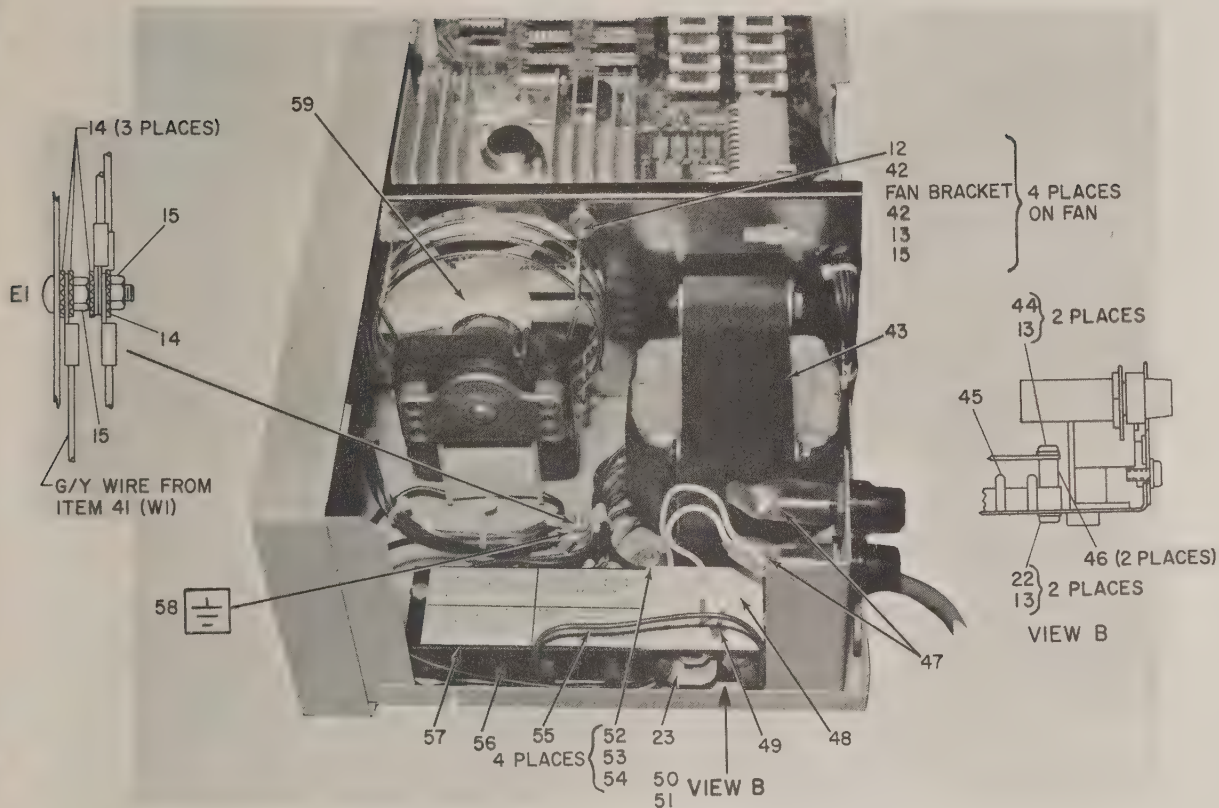


Figure 5-2. TermiNet 9610 Communications Controller Subassembly (Sheet 3 of 3)

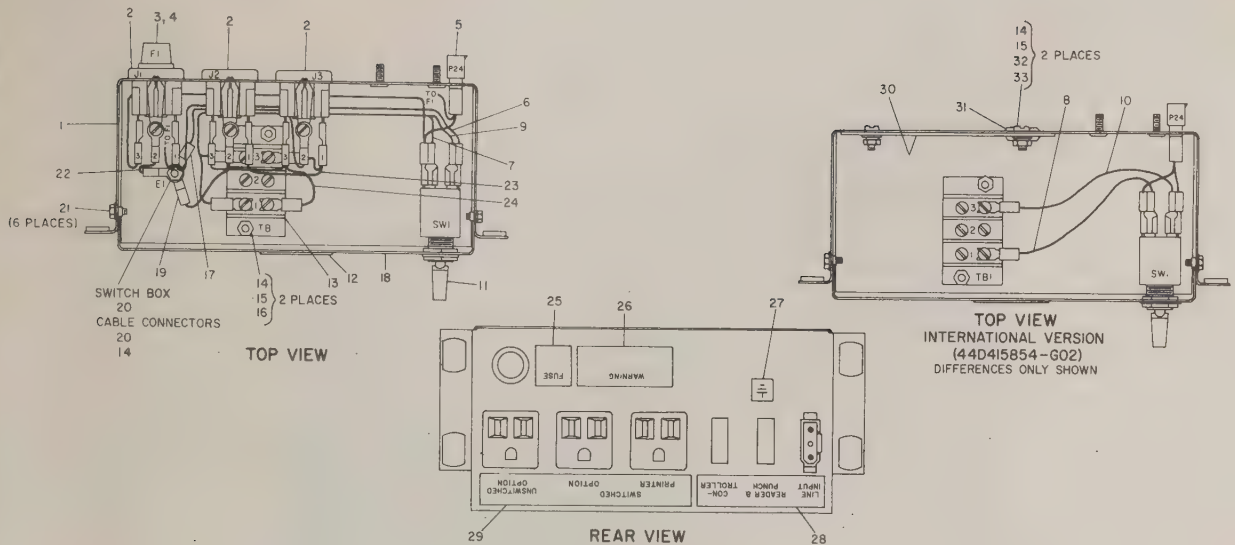
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FIG.	ITEM	DRAWING	DESCRIPTION	CAN BE REPLACED BY THE FOLLOWING PART
5-2	29	44C417568-G01	MPMB/1	Ext. Tooth Lockwasher, steel, No. 10
	30	44C414850-G01	Cover (Includes labels, items 31-36)	
	31	44A951517-002	Nameplate	
	32	44C951714-001	Label (Data Ident)	
	33	44C951703-003	Label (Warning)	
	34	44B951652-039	Label (Neutral)	
	35	44B951652-040	Label (Line)	
	36	44B951667-002	Nameplate (Fuse)	
	37	N403P19C	Lockwasher	
	38	44A417355-001	Fuse Holder (XF1, XF2) (2 Req'd)	
	39	K9774741P13	Fuse 1A, 250V (F1, F2) (2 Req'd)	Plain Washer, steel, No. 6 Pan Hd Screw, steel, No. 6-32x $\frac{1}{4}$
	40	M9729398P4	Cable Strain Relief	
	41	44C414858-G01	Cable (W1)	
	42	N402P37C	Washer (8 Req'd)	
	43	44D415898-G01	Transformer (T1)	
	44	N57P13004C	Screw (2 Req'd)	
	45	N1301P32	Close Back Board (TB1)	
	46	44A410151-006	Spacer (2 Req'd)	
	47	128A4084P19-125	Sleeving (2 Req'd)	
	48	44A411475-001	Cover	
	49	44A951517-001	Label (IEC)	
	50	44A419802-G01	MOV Assembly (RV1)	
	51	44A410335-030	Sleeving	

FIG.	ITEM	DRAWING	DESCRIPTION	CAN BE REPLACED BY THE FOLLOWING PART
5-2	52	N402P38C	Washer (4 Req'd)	Plain Washer, steel, No. 8 Lockwasher, light, steel, No. 8 Hex Nut, steel, No. 3-32
	53	N405P8C	Lockwasher (4 Req'd)	
	54	N210P15C	Nut (4 Req'd)	
	55	44B412379-G54	Jumper	
	56	44B951687-001	Label (Voltages)	
	57	44B951686-001	Label (International brown wire connection instruction)	
	58	44A951553-001	Label (Ground)	
	59	44B501240-G01	Fan (B1)	

NOTES:

1. Front panels include four lenses (44B501232-001).



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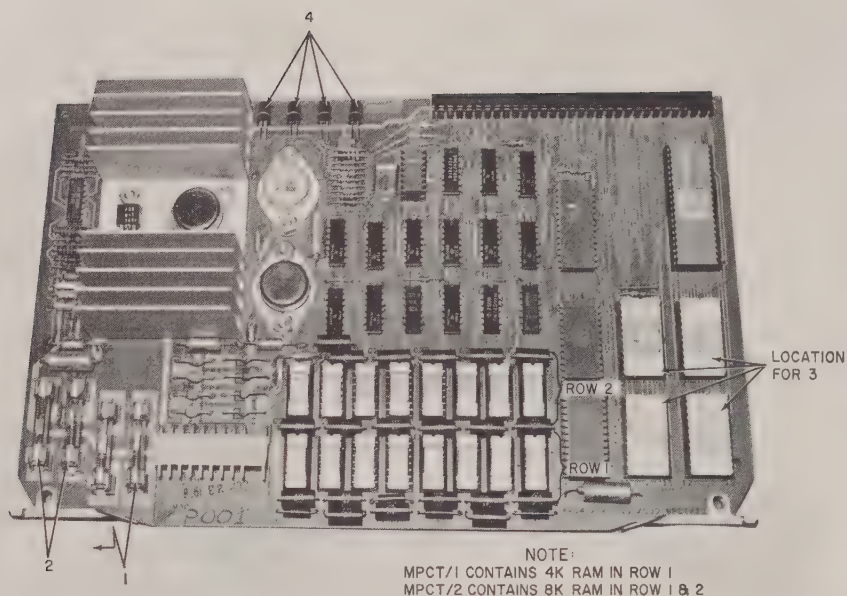
Figure 5-3. A-C Switch Box ((For next higher assembly, see Figure 5-1, item 26.)

AC Switch Box 44D415854-G01 is domestic version.

AC Switch Box 44D415854-G02 is international version.

FIG.	ITEM	DRAWING	DESCRIPTION	CAN BE REPLACED BY THE FOLLOWING PART
5-3	1	44A419830-G01	Switch Box (Rear)(1, 2)	Hex Nut, steel, No. 6-32 Lockwasher, steel, No. 6 Pan Hd Screw, steel, No. 6-32x5/8 Screw-Washer Asm, Hex Hd, steel, No. 6-32x3/4 Plain Washer, Narrow, steel, No. 6 Pan Hd Screw, steel, No. 6-32x3/8
	2	44A417787-002	Outlet (3 Req'd; J1, J2, J3)(1)	
	3	44A417355-001	Fuse Holder (1)	
	4	44A418359-002	Fuse 10A, 250V (1)	
	5	44A411409-G05	Cable (P24)(1)	
	5	44A411409-G06	Cable (P24)(2)	
	6	44A419902-G02	Jumper (J1 to SW1 to F1)(1)	
	7	44A411410-G30	Wire Assembly (White, TB1-SW1)(1)	
	8	44A411410-G32	Wire Assembly (No. 18 white)(2)	
	9	44A411410-G-29	Wire Assembly (Blk, TB1-SW1)(1)	
	10	44A411410-G31	Wire Assembly (No. 18 blk)(2)	
	11	44A418380-001	Toggle Switch (SW1)(1, 2)	
	12	44A410304-773	Label (Switch Box Part No.)(1)	
	12	44A410304-775	Label (Switch Box Part No.)(2)	
	13	N1301P25	Close Back Board (TB1)(1, 2)	
	14	N210P13C	Nut [3 Req'd (1), 4 Req'd (2)]	
	15	N405P7C	Lockwasher [2 Req'd (1), 4 Req'd (2)]	
	16	N57P13010C	Screw (2 Req'd)(1, 2)	
	17	44A411410-G27	Wire Assembly (G/Y 6 lg)(1)	
	18	44D415848-002	Box (Front)(1, 2)	
	19	44A411410-G28	Wire Assembly (G/Y 4.5 lg)(1)	
	20	N403P13C	Lockwasher (2 Req'd)(1)	
	21	N688P13004C	Screw (6 Req'd)(1, 2)	
	22	44A411410-G26	Wire Assembly (G/Y 4 lg)(1)	
	23	44A419902-G01	Jumper (J2 to J3 to TB1)(1)	
	24	44A419902-G03	Jumper (J2 to J3 to TB1)(1)	
	25	44A951578-002	Label (Fuse)(1)	
	26	44A951578-001	Label (Warning)(1)	
	27	44A951553-001	Label (Ground)(1, 2)	
	28	44A951577-002	Label (Line Input)(1, 2)	
	29	44A951577-001	Label (Switched-Unswitched)(1)	
	30	44A419903-001	Cover (2)	
	31	44A417004-008	Grommet (2)	
	32	N402P7C	Washer (2 Req'd)(2)	
	33	N57P13006C	Screw (2 Req'd)(2)	

NOTES: 1. Used on 44D415854-G01. 2. Used on 44D415854-G02.



TCC-7010

Figure 5-4. MPCT Printed Wiring Board

(For next higher assembly, see Figure 5-1, item 31.)

MPCT/1 (44C417566-G01) contains 4K RAM and all required parts except PROM's.

MPCT/2 (44C417566-G02) contains 8K RAM and all required parts except PROM's.

FIG.	ITEM	DRAWING	DESCRIPTION	CAN BE REPLACED BY THE FOLLOWING PART
5-4	1	K9774741P14	Fuse 3A (F3, F4)	
	2	K9774741P16	Fuse 1.5A, 250V (F1, F2)	
	3	44A500610-0XX	PROM's (various, 4 locations)	
	4	44A500878-001	LED (4Req'd)	

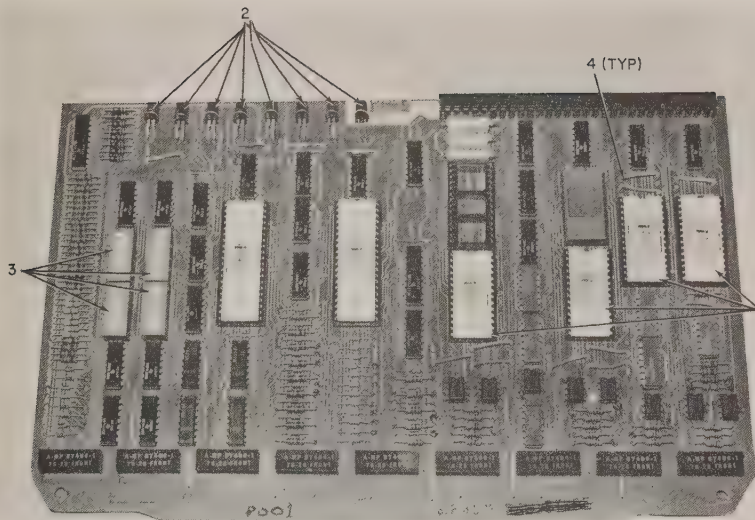


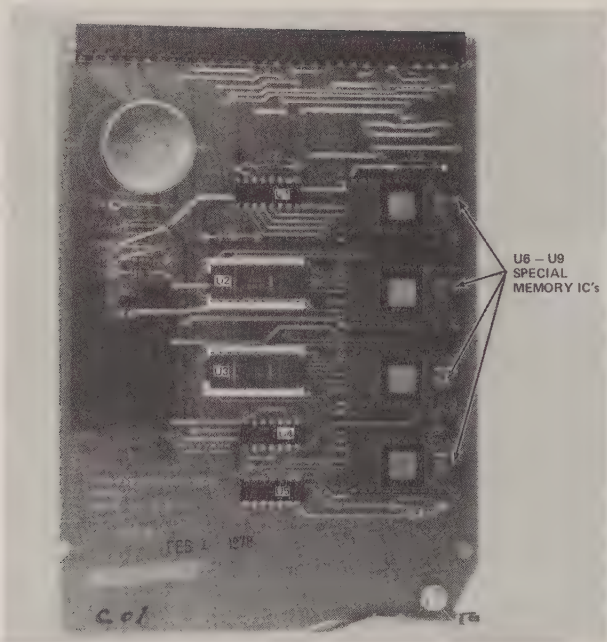
Figure 5-5. MPIO Printed Wiring Board (44C417567-G01)
(For next higher assembly, see Figure 5-1, item 32.)

TCC-7011

FIG.	ITEM	DRAWING	DESCRIPTION	CAN BE REPLACED BY THE FOLLOWING PART
5-5	1	44A502423-001	I/O IC [U92 (PORT 0), U112 (PORT 1), U121 (PORT 2), U131 (PORT 3)] (1)	
	2	44A500878-001	LED (8 Req'd)	
	3	44A500637-001	Dip Switch (8-pole, single throw)(4 Req'd)(S0-S3)	
	4	44A410262-037	Wire Jumper (Strap)(J10-J20)(11 Req'd)	

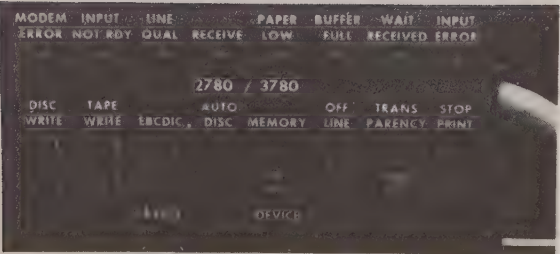
NOTE:

1. In application Input-Output chips (item 1) may vary in number from 2 to 4 chips. Four are included in MPIO PWB 44C417567-G01.



TCC-8002

Figure 5-6. MPEM Printed Wiring Board (44B418282-G01)
(For next higher assembly, see Figure 3-1, item 33).



2780/3780 INTERFACE PANEL



TCC-8003

GRTS INTERFACE PANEL

Figure 5-7. MPSEL Switches and LED's Cable Assembly (44C414990-GXX)
(For next higher assembly, see Figure 3-1, item 34.)

CHAPTER 6

SERVICE DRAWINGS

The drawings in this chapter are supplied to assist in the troubleshooting and repair of the Communications Controller. The drawing descriptions are indexed below by subject; however, the actual drawings are arranged in ascending alphanumeric sequence.

DRAWING INDEX

Mnemonic Glossary Page 6-2

SERVICE DRAWINGS

ELEMENTARIES

Microprocessor and Control (MPCT/2) 44C401579 (4 sh.)

Microprocessor Extended Memory (MPEM/1) 44C402403

Microprocessor Input/Output (MPIO/1) 44C410580 (5 sh.)

Power Elementary 44C401594

INTERNAL CABLE WIRING

AC Power Cable (W1) 44C414858

Cable Assembly (W2) 44C414859

CONNECTION DIAGRAM

Controller 44C401592

WIRING DIAGRAM

Transformer 44D415898

INTERFACE CABLES (TO MPIO PWB)

Switches and LED's Cable (MPSL Assembly) (To MPIO J1) 44C414990-GXX

Parallel Interface (Line Printer) Cable (To MPIO J2/J3) 44B413999-G02

Card Reader Cable (To MPIO J4/J5) 44B419160-G01

Data Set (Sync/Asyn) Cable (To MPIO J6 or J7) 44B418503-G01

Printer Cable (Async Only) Cable 3 Ft. Long (To MPIO J6, J7, J8 or J9) 44B418502-G01

Printer Cable (Async Only) Cable 12 Ft. Long (To MPIO J6, J7, J8 or J9) 44B418502-G02

MNEMONIC GLOSSARY

(Reference: Drawing No. 44A400693)

MPMB/1 is a fully bussed Mother Board for the microprocessor controller. It has four sets of sixty pins for interconnecting up to four plug-in logic boards. The following list indicates the signals appearing at the connector pins by signal name and by pin. Because MPMB/1 is fully bussed, the list applies to each of the four connectors.

<u>SIGNAL NAME</u>	<u>PIN</u>	<u>DEFINITION</u>	<u>SIGNAL NAME</u>	<u>PIN</u>	<u>DEFINITION</u>
0V	1, 59	Logic Ground	DB2	47	System Data Bus
+12V	8	+12V DC Supply	DB3	58	System Data Bus
+5V	9, 10	+5V DC Supply	DB4	48	System Data Bus
-5V	5	-5V DC Supply	DB5	56	System Data Bus
-12V	12	-12V DC Supply	DB6	42	System Data Bus
6.5 us	31	Clock with 6.5 micro-second period	DB7	55	System Data Bus
A0	36	Address Bus	DBIN	44	Data bus in input mode
A1	35	Address Bus	$\overline{\text{DISI/O}}$	3	Disable I/O device (MPIO)
A2	53	Address Bus	$\overline{\text{DISMEM}}$	25	Disable ROM and RAM (MPCT)
A3	54	Address Bus	$\overline{\text{DISROM}}$	20	Disable ROM (MPCT)
A4	51	Address Bus	$\overline{\text{FREF}}$	11	Force RAM refresh cycle
A5	52	Address Bus	FRM/GND	2	Frame Ground
A6	49	Address Bus	HLDA	27	Hold request acknowledge
A7	50	Address Bus	$\overline{\text{HOLD}}$	6	Hold request to 8080A
A8	26	Address Bus	INT	15	Interrupt request to 8080A
A9	23	Address Bus	$\overline{\text{INTA}}$	13	Interrupt request acknowledge
A10	34	Address Bus	INTE	4	Interrupts enabled
A11	24	Address Bus	$\overline{\text{I/OR}}$	21	I/O read command
A12	39	Address Bus	$\overline{\text{I/OW}}$	22	I/O write command
A13	18	Address Bus	$\overline{\text{MBUSY}}$	7	Memory busy
A14	17	Address Bus	$\overline{\text{MEMR}}$	29	Memory read command
A15	32	Address Bus	$\overline{\text{MEMW}}$	30	Memory write command
BUSEN	40	Enable for control bus driver (MPCT)	$\emptyset\text{TTL}$	33	TTL level $\emptyset\text{2}$ clock signal (2 MHz)
D1	37	Bit 1 of the 8080 data bus (<u>not</u> system bus)	OSC	19	18 MHz square wave
D5	41	Bit 5 of the 8080 data bus (<u>not</u> system bus)	RESET	45	System reset signal
DB0	60	System Data Bus	$\overline{\text{RESIN}}$	14	Input reset driver (generally an analog signal)
DB1	57	System Data Bus	RDYIN	16	Ready in from slow memory or I/O devices

<u>SIGNAL NAME</u>	<u>PIN</u>	<u>DEFINITION</u>
SPARE	38	
SYNC	43	Synchronize signal indicates start of a machine cycle
WAIT	46	CPU in wait state in response to RDYIN or HALT
+KEY+	28	

44B418503
CONT ON SHEET FNL SH NO 1

GENERAL ELECTRIC

44B418503
CONT ON SHEET FNL SH NO 1

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING—

APPLIED PRACTICES	SURFACES	FRACTIONS	DECIMALS	ANGLES
289A500AL	✓	+	+	+

TITLE

44B418503
CONT ON SHEET FNL SH NO 1

CABLE, DATA SET

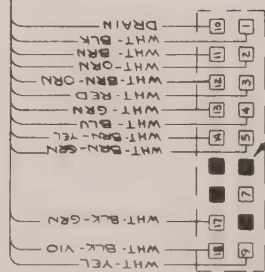
FIRST MADE FOR 354000

PL ISSUED

CONNECTION CHART FOR CABLE PT NO. 1

WIRE COLOR	FROM	TO	SIGNAL TERM. PT NO.	(REF)
DRAIN	P2-1	PI-10	G	FRAME
WHT-BLK	P2-2	PI-1	G	DATA
WHT-BRN	P2-3	PI-11	G	RDATA
WHT-RED	P2-4	PI-3	G	RTS
WHT-ORN	P2-5	PI-2	G	CTS
WHT-YEL	P2-6	PI-9	G	DSR
WHT-GRN	P2-7	PI-13	G	OV
WHT-BLU	P2-8	PI-4	G	CARDDET
WHT-BLK-GRN	P2-15	PI-17	G	TCL
WHT-BLK-VIO	P2-17	PI-18	G	RCL
WHT-BRN-ORN	P2-20	PI-12	G	DTR
WHT-BRN-YEL	P2-21	PI-14	G	SPARE
WHT-BRN-GRN	P2-22	PI-5	G	SPARE

CONNECTION DIAGRAM

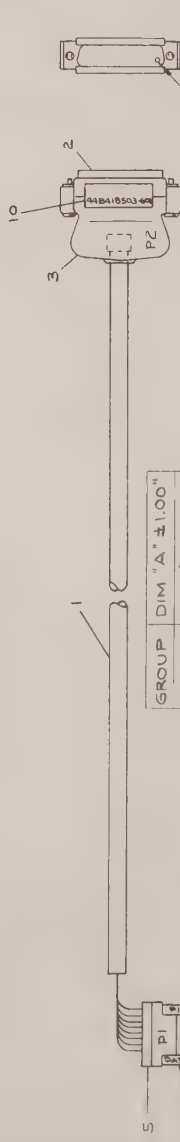


PI (WIRING SIDE)

INSTALL TERMINAL (PT NO. 6) INTO TERMINAL CAVITIES AS INDICATED BY SHADED AREAS (4 PLACES)

P2

(WIRING SIDE)



PIN NO. 1

END VIEW

STRAIN RELIEF, 2 1/2 TURNS PT NO. 7

PI END STRIP ALL LEADS .12

P2 END STRIP ALL LEADS .19

CABLE (PT NO. 1) PREPARATION VIEW

"A"

- NOTES:
1. CLIP OFF ALL UNUSED LEADS FLUSH WITH THE CABLE INSULATION ON BOTH ENDS.
 2. PLACE SLEEVING PT NOS. 8 & 9 ON DRAIN WIRES BEFORE ATTACHING TERMINALS.
 3. THE NOMENCLATURE SHOWN ON THE LABELS IS FOR ORIENTATION ONLY.

REVISIONS

PRINTS TO

1	75-5655	APR 28 1975	18	71
2	75-5675	MAY 30 1975	91 ²	96
3	76-556	FEB 20 1976	104 ³	
4	77-5700	SEP 15 1977	92 ²	
			33	
			41	

APPROVALS

MADE BY
ISSUED
NG/15 1974

DCPD

DV OR

DEPT

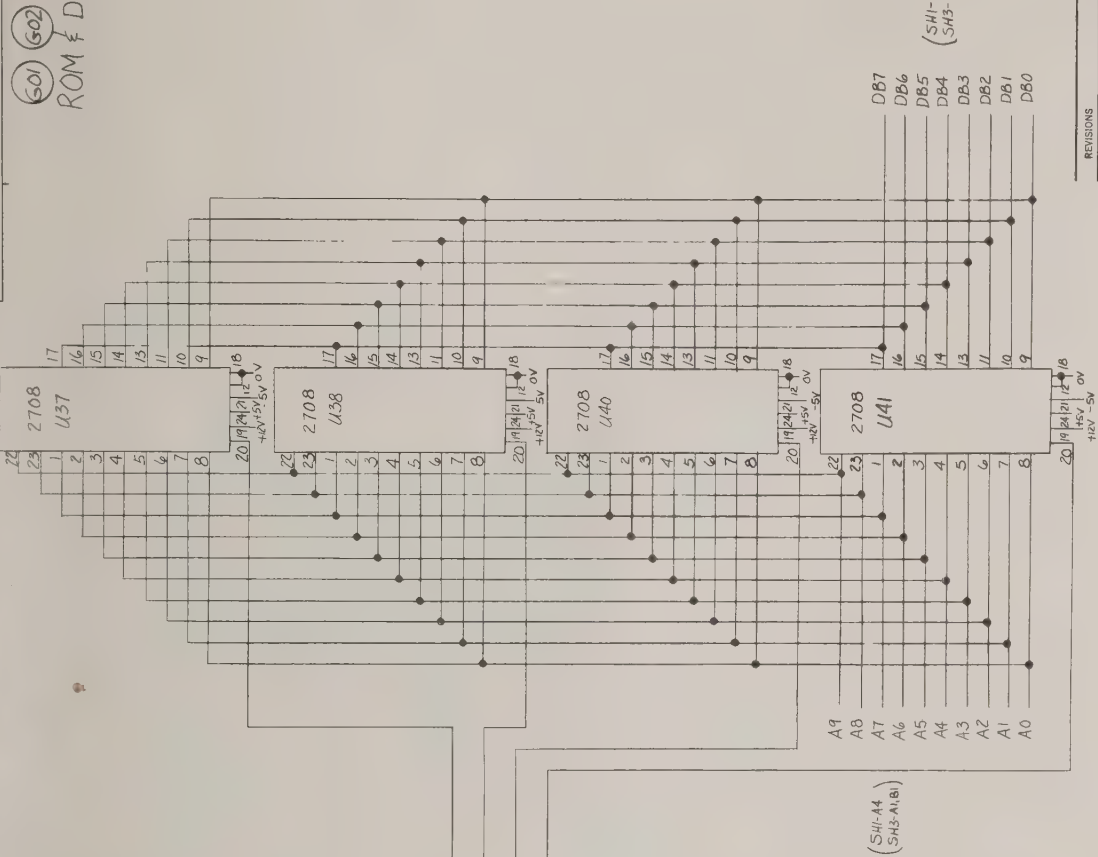
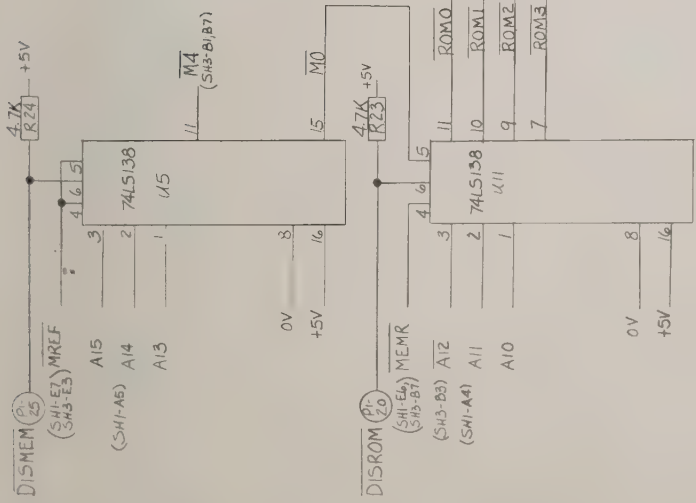
LOCATION

FNL SH NO 1

44B418503

MICROPROCESSOR (MPCT11)
 AND CONTROL
 FIRST MADE FOR
 REF 44C401579

APPLIED PRACTICES	SURFACES	FRACTIONS	DECIMALS	ANGLES
✓	✓	✓	✓	✓



(501) (502)
 ROM & DECODE

44C401579
 CONT ON SHEET 3

REV NO.

(SH1-C6) (SH3-A5-D5)

PRINTS TO	REV NO.
912 92	382 41
673 71	77 793
82 84	105

DATA COMMUNICATOR
 WAYNESBORO, VA

44C401579
 CONT ON SHEET 3

44C401579 (MPCT/1)
AND CONTROL
FIRST MADE FOR
ECF 44C417544-G0100

APPLIED PRACTICES	SURFACES	FRACTIONS	DECIMALS	ANGLES
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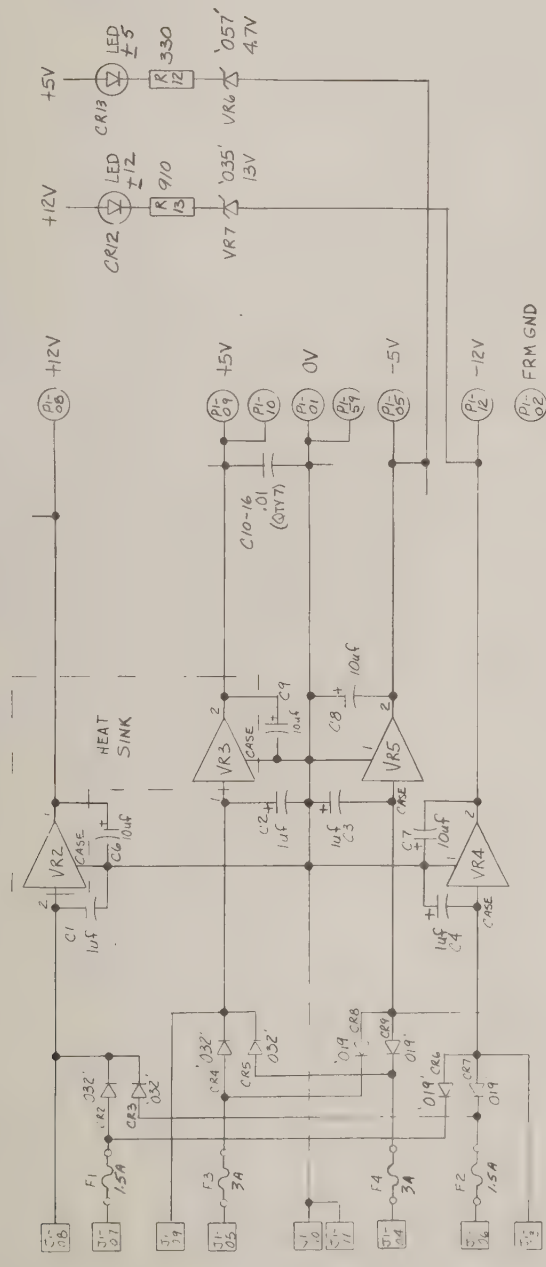
501 602

POWER SUPPLY

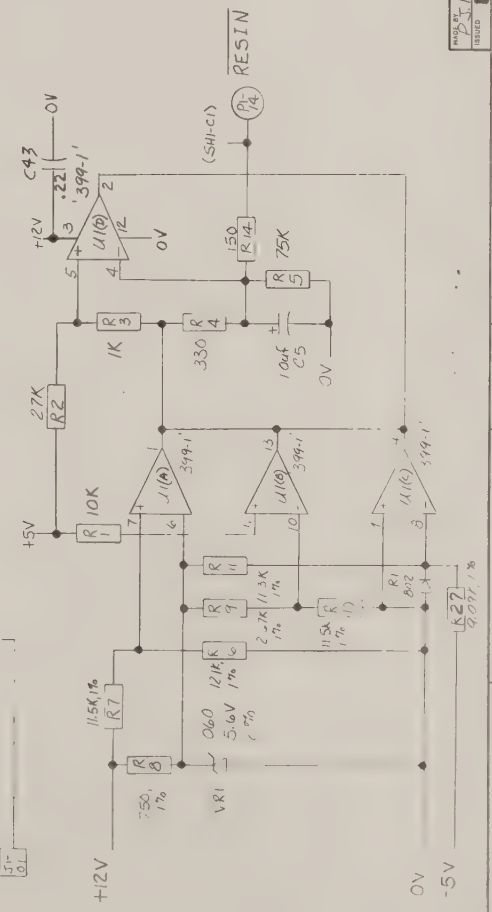
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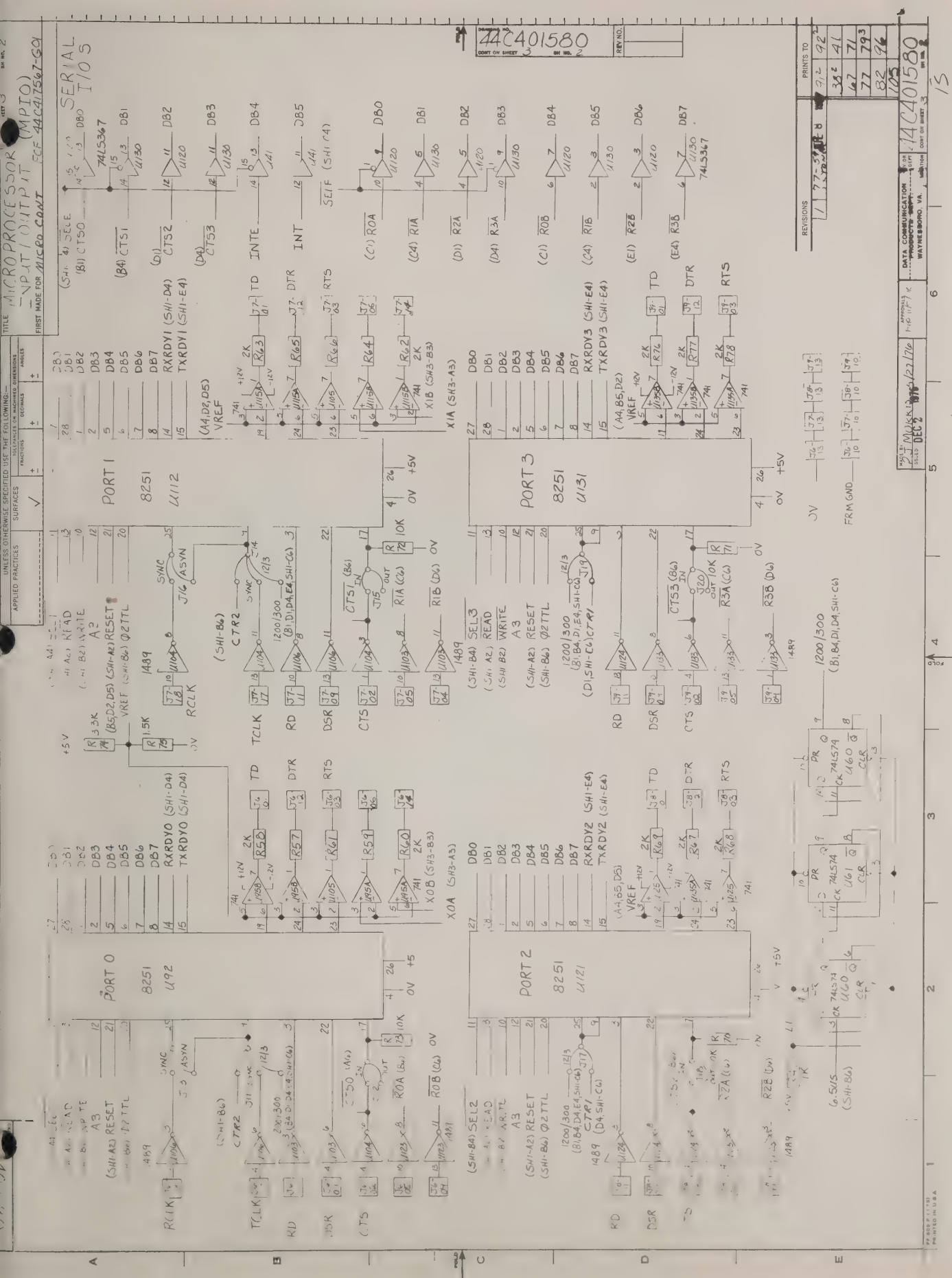
REV. NO.	
----------	--

PRINTS TO	REV. NO.
912 92	1
382 41	2
673 71	3
77 79	4
82 96	5
105	6



FRM GND





085107 JAV

44C401580

GENERAL ELECTRIC

4

5

6

7

8

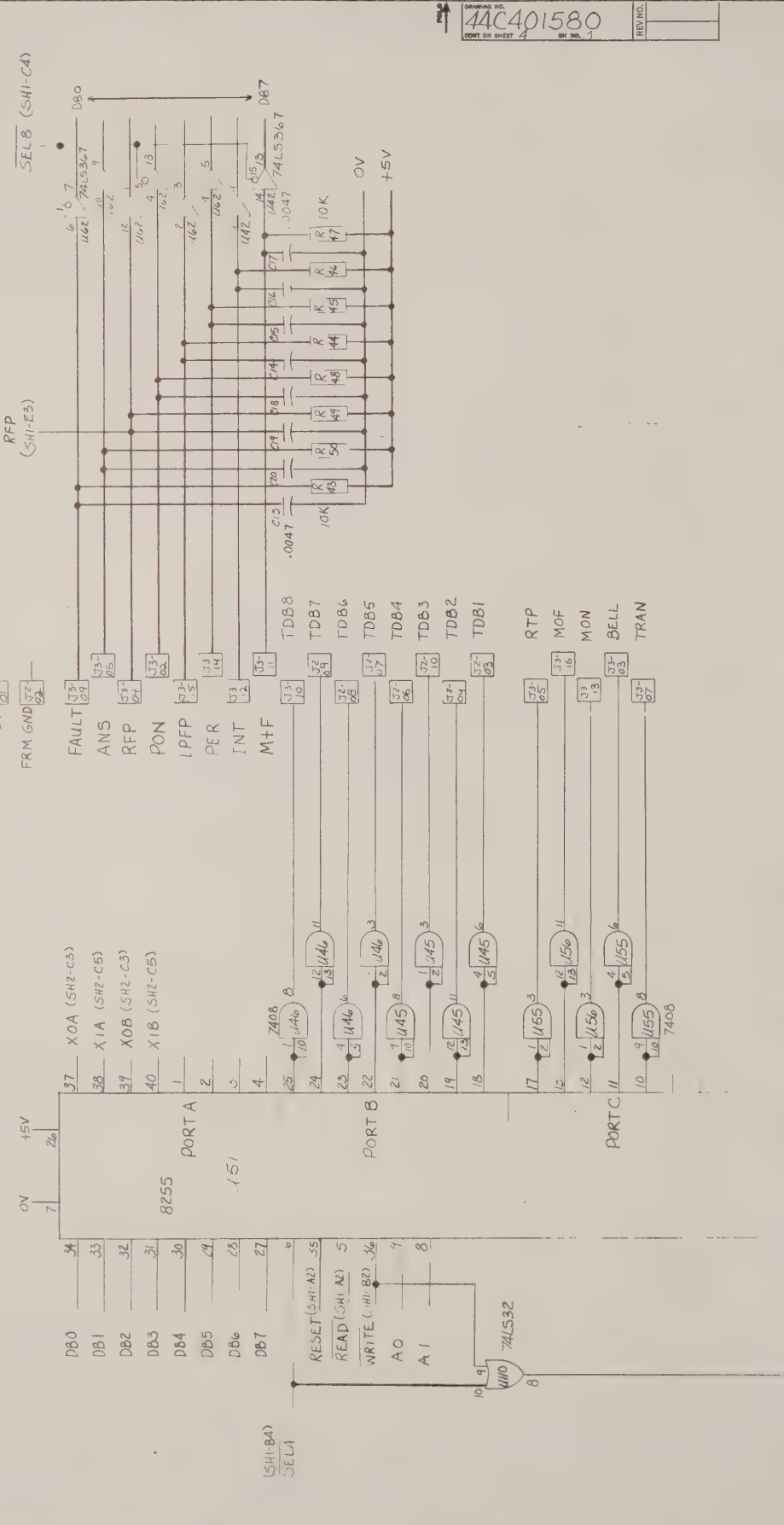
9

10

TITLE MICROPROCESSOR
INPUT/OUTPUT (MPIO)
FIRST MADE FOR ALG-60 CONT. FCF 24C41756 7-GOL

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:	APPLIED PRACTICES	SURFACES	FUNCTIONS	REMARKS
	✓			

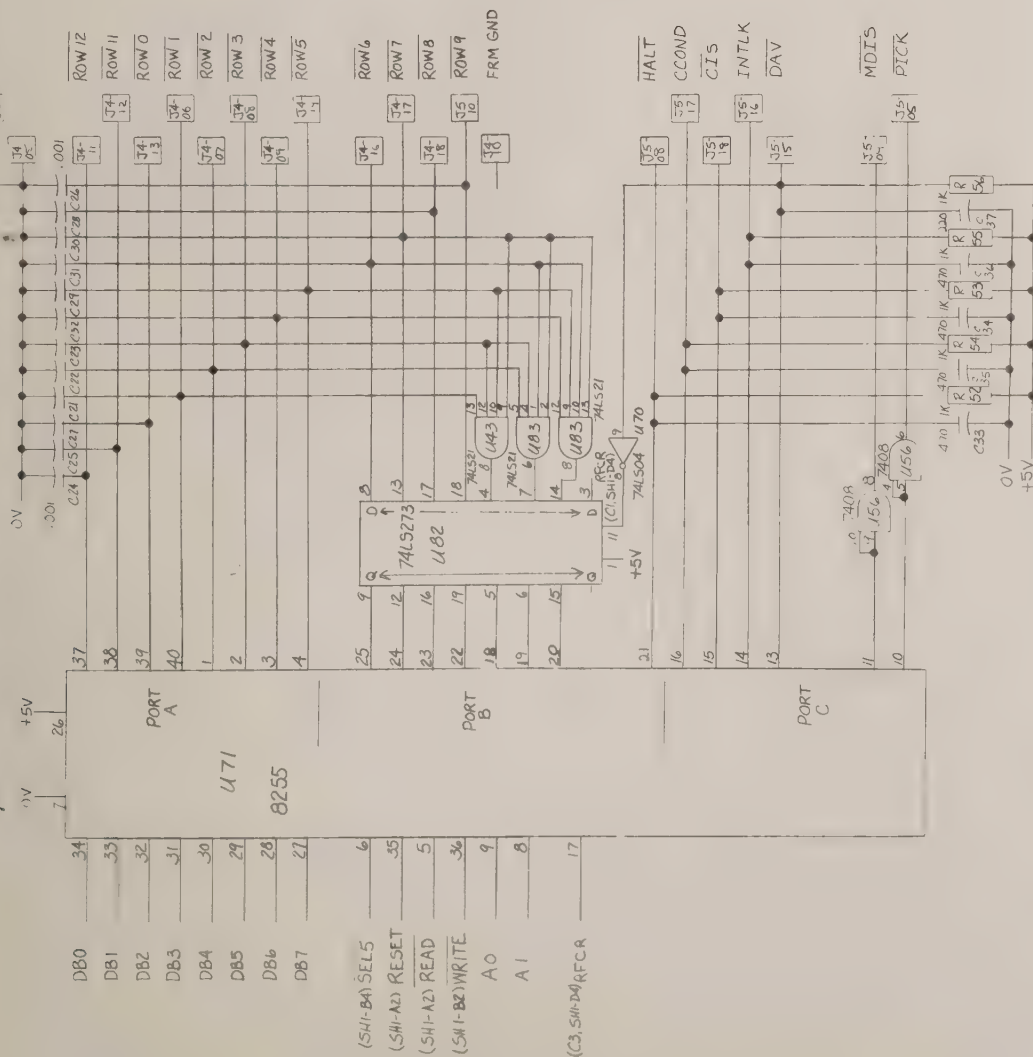
PRINTER INTERFACE
1 SPARE EIA OUTPUTS



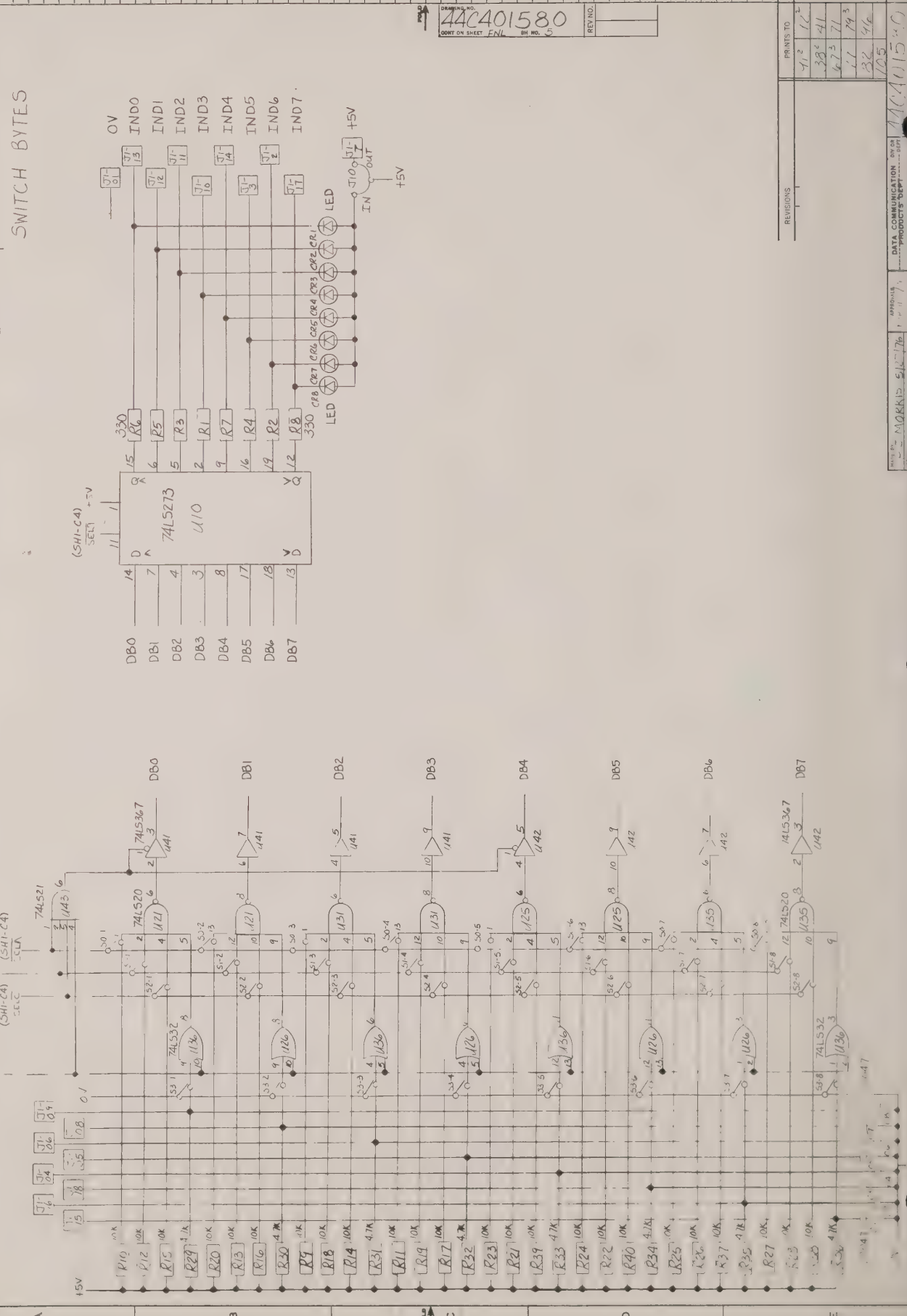
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382 41												
673 71												
11 113												
82 96												
105												

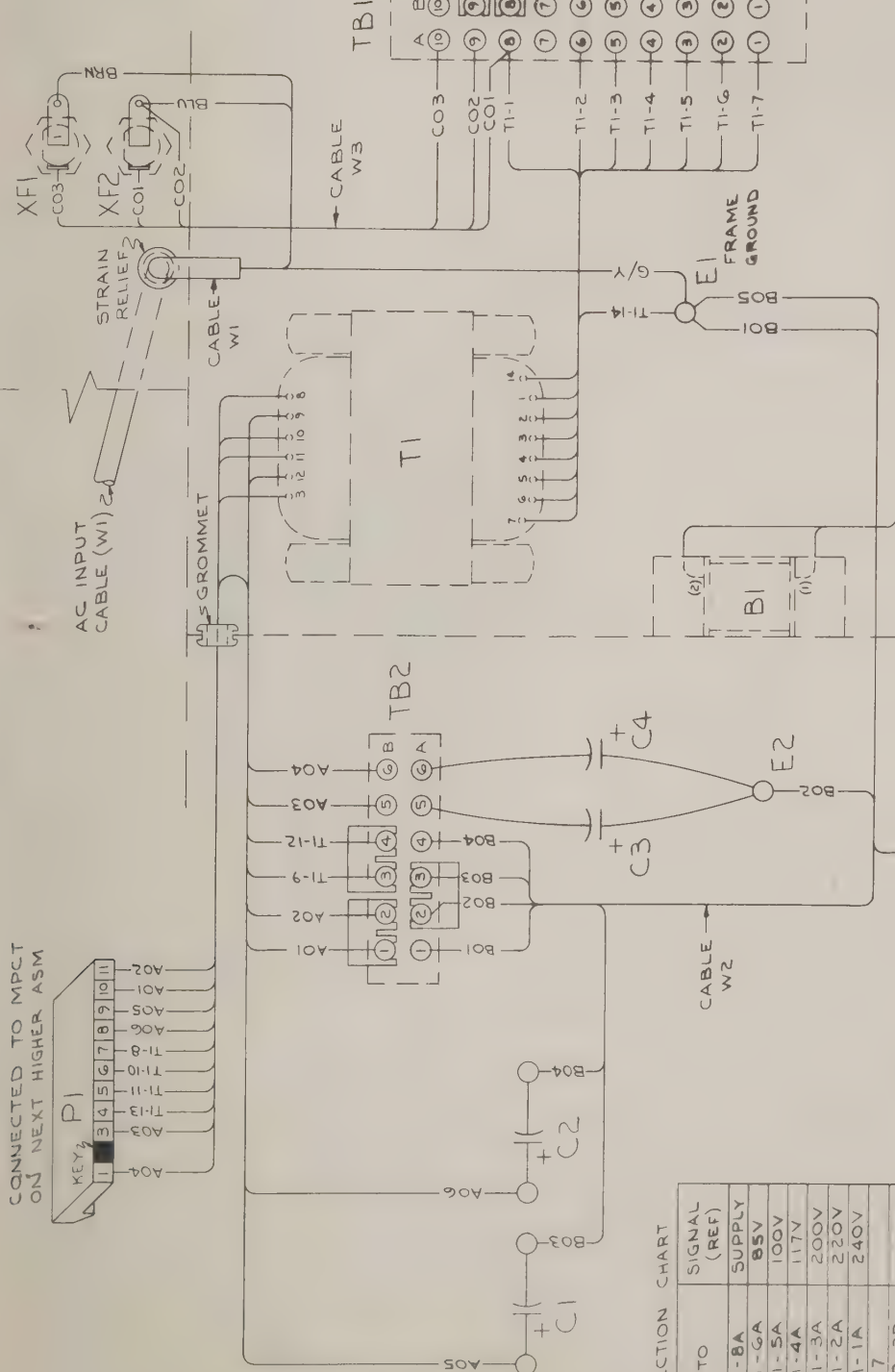
44C401580

CARD READER INTERFACE



REVIEWS	PRINTS TO
	712 92 ²
	38° 41
	673 71
	77 79 ³
	82 96





T. CONNECTION CHART

LEAD NO.	TO	SIGNAL (REF)
1	TBI-8A	SUPPLY
2	TBI-9A	85V
3	TBI-5A	100V
4	TBI-7A	117V
5	TBI-3A	200V
6	TBI-2A	220V
7	TBI-1A	240V
8	PI-7	
9	TB2-3B	
10	PI-6	
11	PI-5	
12	TB2-4B	
13	PI-4	
14	E	FRAME GRN

BI" CONNECTION CHART

LEAD NO	TO	SIGNAL (REF)
1	TBI-8B	SUPPLY
2	TBI-9B	85V

* SELECTED BY CUSTOMER
TO MATCH LOCAL SUPPLY
LINE VOLTAGE

REVISIONS	PRINTS TO	
1	AN 76-4 MAR 3 877	18
2	ANT 7-86 MAR 21 1986	30
3	ANT 77-42 MAR 21 1986	41
		91
		92
		96

QMS USE ONLY
PROPERTY OF
MEMPHIS, VA

44C401592

DATE OF
REVISION
BY NO. 1

QMS USE ONLY
PROPERTY OF
MEMPHIS, VA

44C401592

DATE OF
REVISION
BY NO. 1

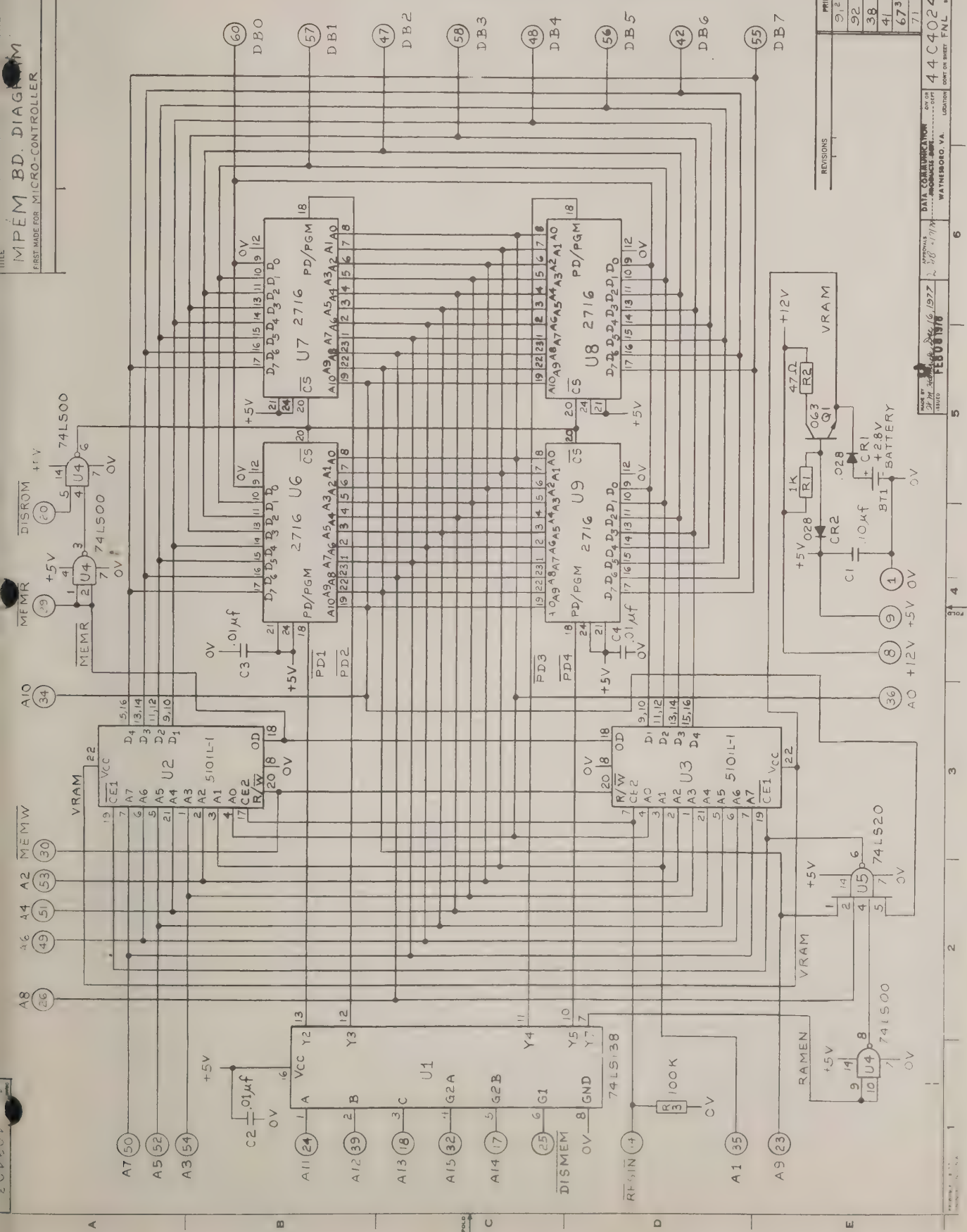
44C402403

REVNO

PRINTS TO	REVNO
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92 793	2
38 82	3
41 105	4
673 96	5
71	6

DATE COMPLETION
20 FEB 1977
WAINESBORO VA

44C402403

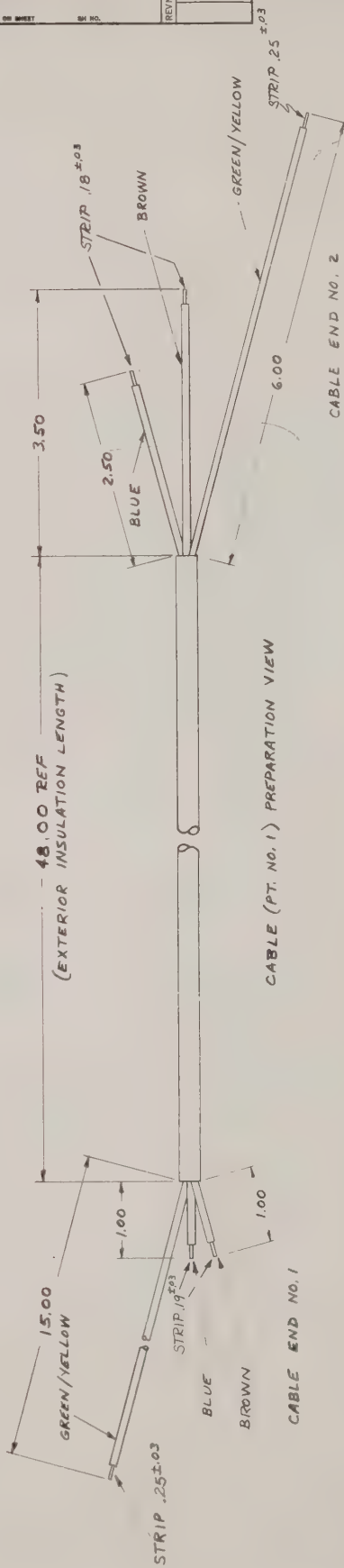
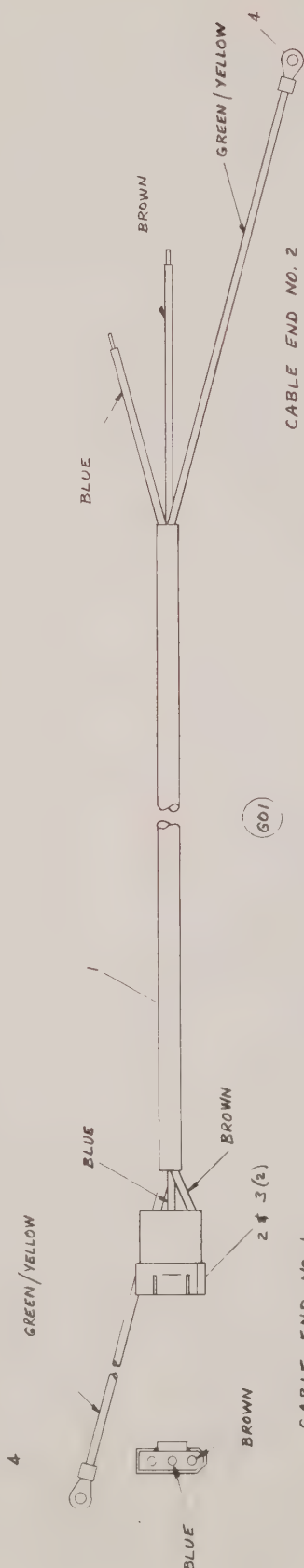


TITLE

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:-

APPLIED PRACTICES	SURFACES	FACTORS	DETAILS	FINISHES
389A500AL	✓	+	+	+
		± .12	+	+

A.C. CABLE ASM: (WI)
FIRST MADE FOR MICROCONTROLLER FCF 44DA1896
P.L. ISSUED



NOTE:
1. CUT CABLE TO 69.00 ± .50 INCHES
BEFORE STRIPPING PROCEDURE.

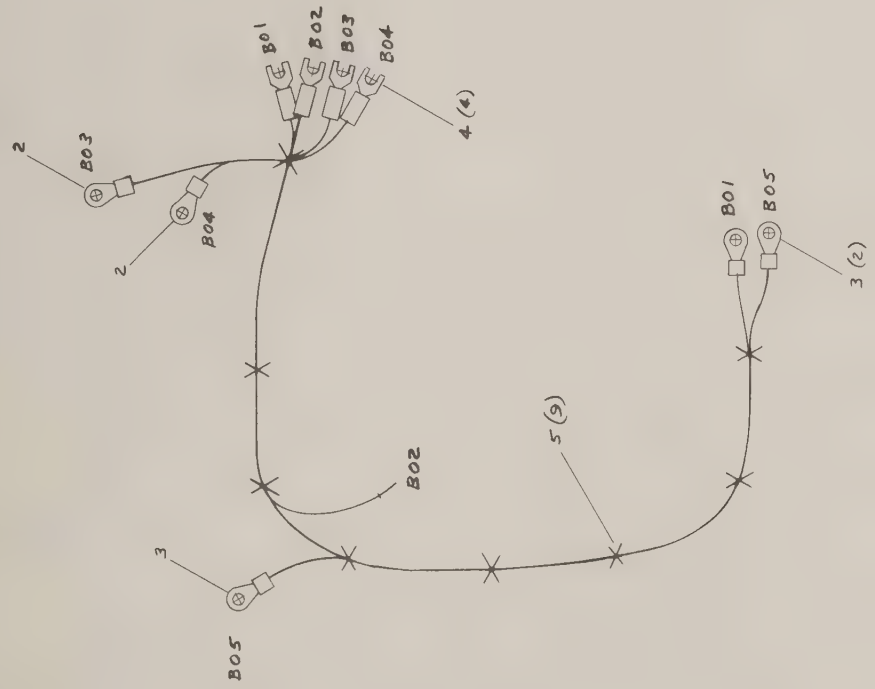
REVISIONS	PRINTS TO
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12	12
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90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:-
 APPLIED PRACTICES SURFACES
 2.89A500AL
 CHECKED FOR DIMENSIONS
 FACILITIES FOR DETAILS
 + + + +
 ✓

CABLE ASM. (W)
 FIRST MADE FOR MICROCONTROLLER FEE 040405896

PL ISSUED

WIRE WIDE NO PT NO.	COLOR	WIRE DWE. NO.	LENGTH ±.12	FROM		TO		SIGNAL (REF.)
				STRIP ±.03	TERMINAL PART NO.	ROUTING ±.03	TERMINAL PART NO.	
B01 001	G/Y	B23F352-614	14.00	.25	44A418609-201	ZONE 5C .19	44A418603-007	ZONE 4E FRAME GND
B02 006	BLK	B23F242-BLK	6.50	.25	44A418609-201	ZONE 5C .38		ZONE 3C OV
B03 006	BLK	B23F242-BLK	3.50	.25	44A418609-201	ZONE 5C .25	44A418600-003	ZONE 4B OV
B04 006	BLK	B23F242-BLK	2.50	.25	44A418609-201	ZONE 5C .25	44A418600-003	ZONE 4C OV
B05 001	G/Y	B23F352-614	9.25	.19	44A418603-007	ZONE 3C .19	44A418603-007	ZONE 4E FRAME GND



REVNO. 44C414859

PRINTS TO

1	44C414859	3	15197
2	44C414859	3	15197

DATA COMMUNICATION

44C414859

WATERSBORD, VA.

A

WIRE NO.	PART NO.	COLOR	WIRE DWG. NO.	LENGTH	FROM		ROUTING	TO		ROUTING	REF.
					±.25 STRIP	±.05 TERMINAL PART NO.		±.03 STRIP	±.03 TERMINAL PART NO.		
AO1	008	BLK	B23F2AZ-BLK	11.00	.12	44A418608-001	PI-10	.25	44A418609-201	ZONE E6	TB2-1B
AO2	↑	↑	↑	10.25	.12	↑	PI-11	.25	↑	ZONE E6	TB2-2B
AO3	↑	↑	↑	10.12	.12	↑	PI-3	.25	↑	ZONE E5	TB2-5B
AO4	↑	↑	↑	9.88	.12	↑	PI-1	.25	44A418609-201	ZONE E5	TB2-6B
AO5	↓	↓	↓	15.25	.12	↓	PI-9	.25	44A418600-003	ZONE E8	C1(+)
AO6	008	BLK	B23F2AZ-BLK	14.00	.12	44A418608-001	PI-8	.25	44A418600-003	ZONE E7	C2(+)
1	↑	BLK	↑	---	---	---	T1	.25	44A418609-201	ZONE E3	TB1-8A
2	↑	↑	↑	---	---	---	T1	.25	↑	ZONE D3	TB1-6A
3	↑	↑	↑	---	---	---	T1	.25	↑	---	TB1-5A
4	↑	↑	↑	---	---	---	T1	.25	↑	---	TB1-4A
5	↑	↑	↑	---	---	---	T1	.25	↑	---	TB1-3A
6	↑	↑	↑	---	---	---	T1	.25	↑	---	TB1-2A
7	↑	↑	↑	---	---	---	T1	.25	44A418609-201	ZONE D3	TB1-1A
8	↑	↑	↑	---	---	---	T1	.12	44A418608-001	PI-7	---
9	↑	↑	↑	---	---	---	T1	.25	44A418609-201	ZONE E6	TB2-3B
10	↑	↑	↑	---	---	---	T1	.12	44A418608-001	PI-6	---
11	↑	↑	↑	---	---	---	T1	.12	44A418608-001	PI-5	---
12	↑	↑	↑	---	---	---	T1	.25	44A418609-201	ZONE E6	TB2-4B
13	↑	BLK	↑	---	---	---	T1	.12	44A418608-001	PI-4	---
14	↑	G/Y	↑	---	---	---	T1	.25	44A418600-002	ZONE D4	E1

B

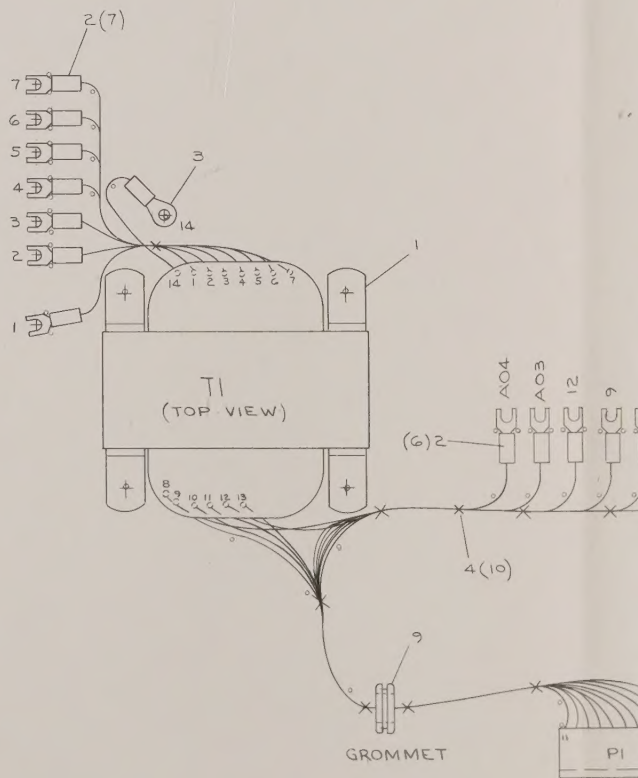
C

D

E

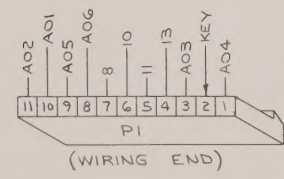
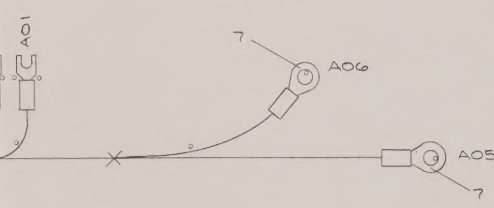
F

H



G01 NAILS - 52
TIES - 10

5	7	8	9	10	11					
				GENERAL ELECTRIC						
				44D415898 CONT ON SHEET F.N.L. SH. NO. 1						
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING: -										
APPLIED PRACTICES 289A500AL	SURFACES ✓	TOLERANCES ON DIMENSIONS <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%;">FRACTIONS</td> <td style="width:50%;">DECIMALS</td> </tr> <tr> <td style="text-align: center;">+</td> <td style="text-align: center;">+</td> </tr> </table>		FRACTIONS	DECIMALS	+	+	REV. NO. 44D415898	TITLE TRANSFORMER ASM FIRST MADE FOR MICROCONTROLLER FCF 44D415896	
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REVISONS	PRINTS TO
1 <i>ANTL-9100</i>	38
2 <i>ANTL-3038</i> JAN 3 1977	74
3 <i>ANTL-3038</i> SEP 15 1977	91
4 <i>ANTL-3038</i> SEP 27 1977	92
5 <i>ANTL-3038</i> NOV 23 1977	96
	104

DATE NOV 8 1976	ISSUED NOV 8 1976	DATA COMMUNICATION WAYNESBORO, VA	44D415898 CONT ON SHEET F.N.L. SH. NO. 1
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Data Communication Products Business Department • General Electric Company

Waynesboro, Virginia 22980, USA



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